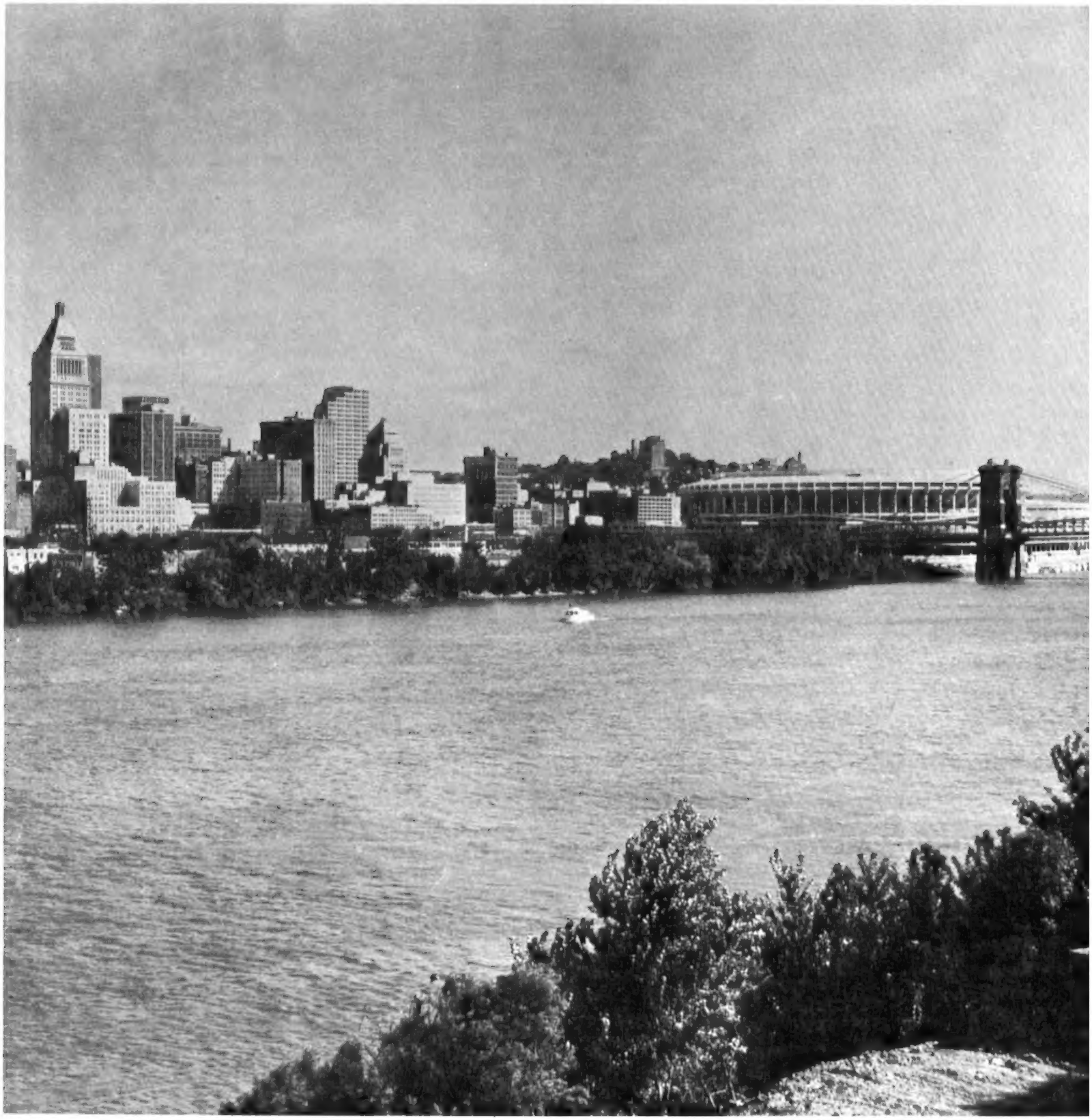
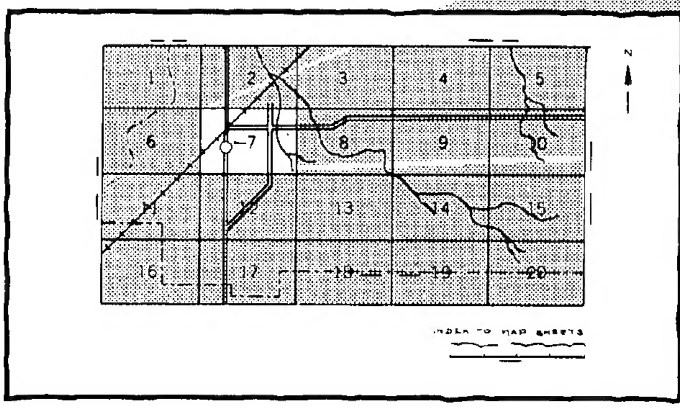
United States Department of Agriculture
Soil Conservation Service
in cooperation with
Ohio Department of Natural Resources
Division of Lands and Soil, and
Ohio Agricultural Research and Development Center

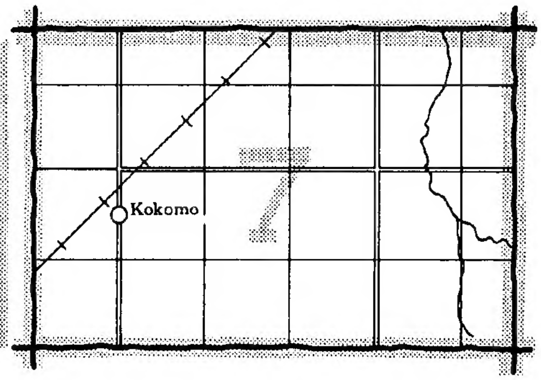
soil survey of Hamilton County Ohio



HOW TO USE

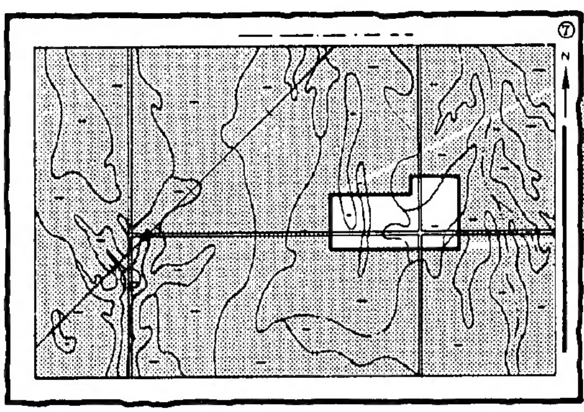
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

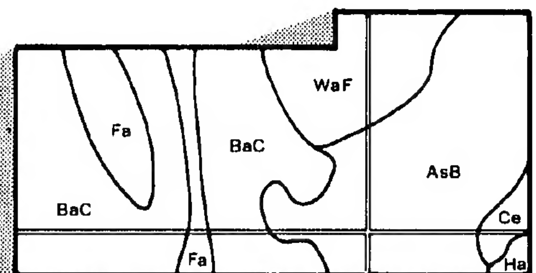




2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





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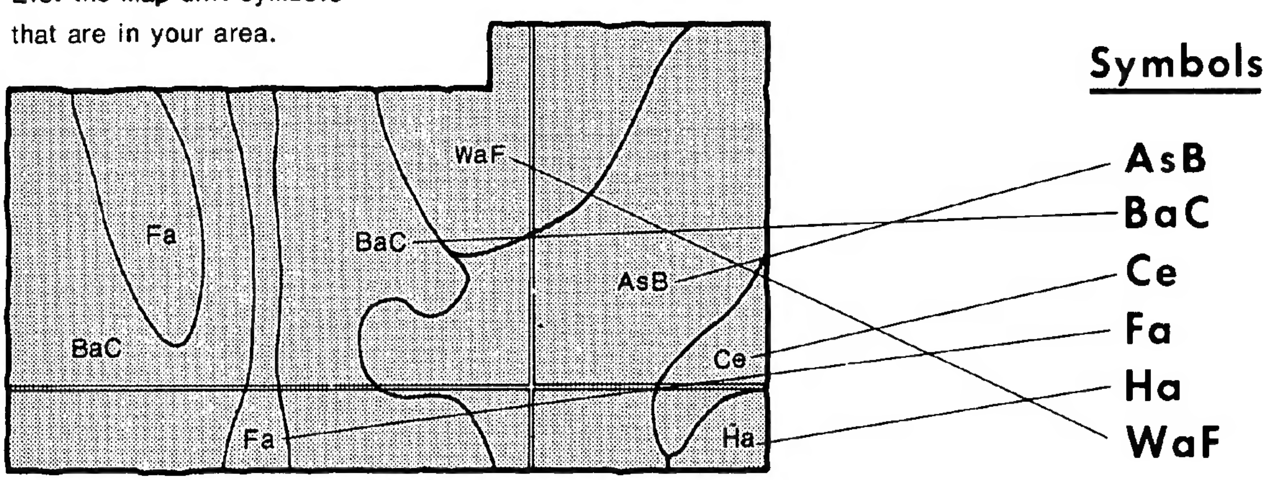
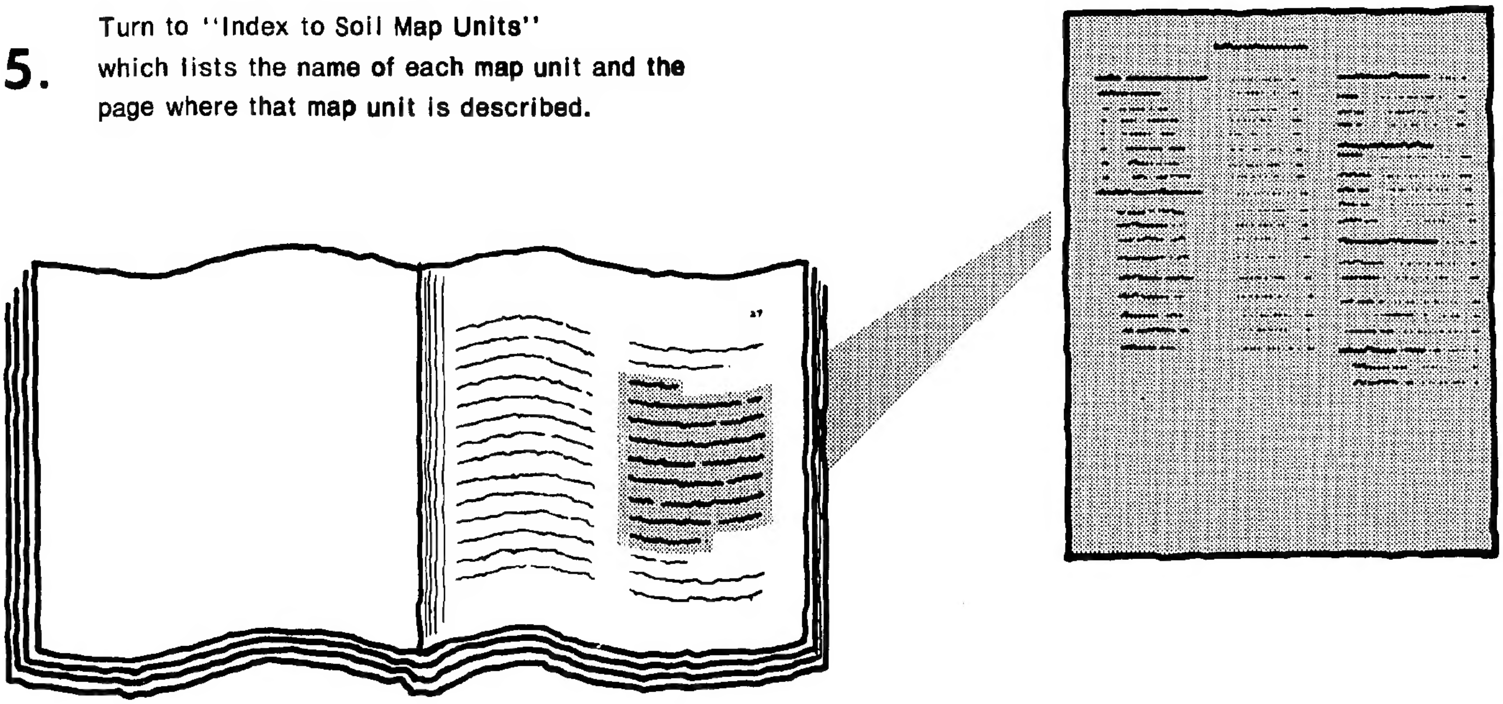
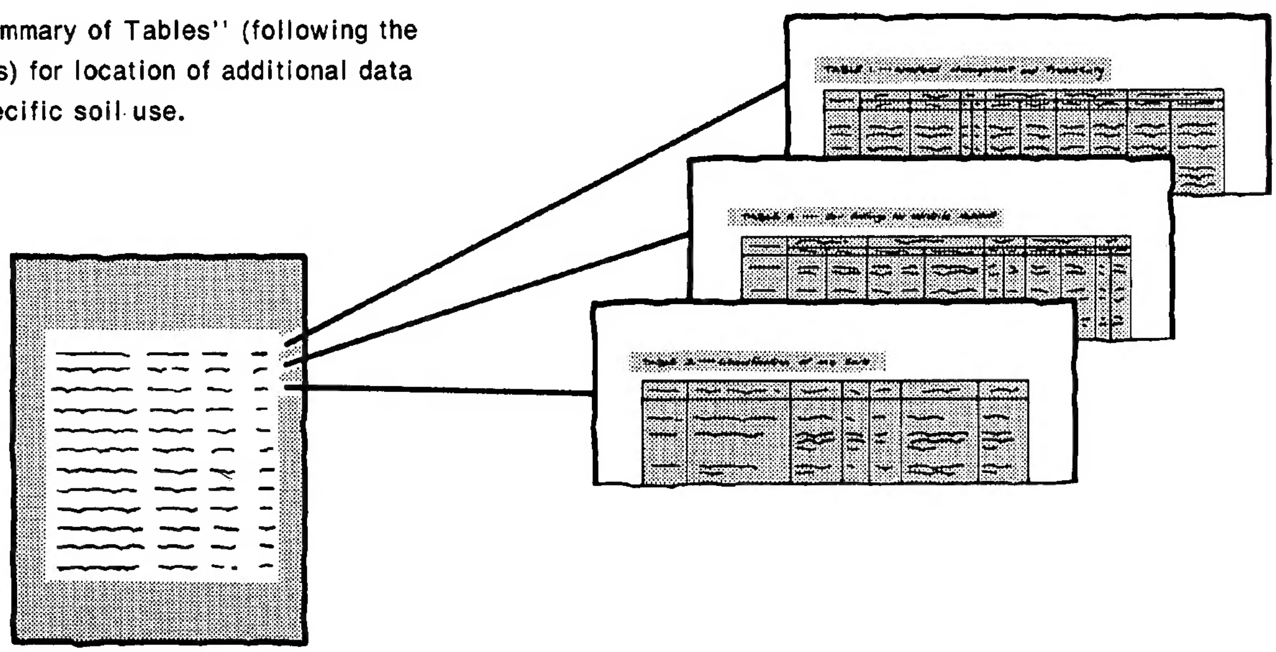


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service; the Ohio Department of Natural Resources, Division of Lands and Soil; and the Ohio Agricultural Research and Development Center. It is part of the technical assistance furnished to the Hamilton County Soil and Water Conservation District. The Hamilton County Commissioners and the city of Cincinnati contributed funds for the survey. Major fieldwork for this soil survey was performed in the period 1975-79. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

This survey updates the soil survey of Hamilton County published in 1917 (*12*).

Cover: Cincinnati skyline along the Ohio River. Huntington soils are on the flood plain.

Contents

Soil series

Issued August 1982

Index to map units

Summary of tables

Foreword

This soil survey contains information that can be used in land-planning programs in Hamilton County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A water table near the surface makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Robert R. Shaw

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State Conservationist
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Location of Hamilton County in Ohio.

Soil survey of
Hamilton County, Ohio

By N. K. Lerch, W. F. Hale, and D. D. Lemaster
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with
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and Ohio Agricultural Research and Development Center

General nature of the survey area

Hamilton County is in the southwestern corner of Ohio, along the Kentucky and Indiana borders. It occupies about 413 square miles, or 265,152 acres. Cincinnati, the county seat, is in the south-central part of the county, along the Ohio River. In 1970 the population of the county was 924,018, making it the second most populous county in the state.

The landscape is characterized by wide terraces and flood plains, steep hillsides along the major rivers and tributary stream valleys, and gently rolling glacial till plains.

More than half of the survey area has been converted from agricultural and forestry uses to urban uses. The dominant urban use is residential development. The dominant industries in the area manufacture machine tools, jet engines, automobiles, and soap and detergents. Urbanization is increasing, particularly in the areas near the interstate highways, and is resulting in pressure for the development of flood plains and steep hillsides, where flooding and landslide are severe hazards.

The remaining agricultural areas are in the valleys of the Great Miami, Whitewater, and Little Miami Rivers. The soils in these valleys are fertile; and good yields of corn, soybeans, wheat, hay, and garden vegetables are common. Flooding generally does not occur during the normal growing season of those crops.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Hamilton County is cold in winter but quite hot in summer. Winter precipitation, frequently snow, results in a good accumulation of soil moisture by spring and minimizes drought during summer on most soils. Normal annual precipitation is adequate for all crops that are adapted to the temperature and length of growing season in the area.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Cincinnati and Fernbank in the period 1951 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 33 degrees F at Cincinnati and 32 degrees at Fernbank, and the average daily minimum temperature is 24 degrees at Cincinnati and 23 degrees at Fernbank. The lowest temperature on record, which occurred at Cincinnati on January 28, 1963, is -20 degrees. In summer the average temperature is 74 degrees at Cincinnati and 71 degrees at Fernbank, and the average daily maximum temperature is about 85 degrees. The highest recorded temperature, which occurred at Cincinnati on July 29, 1952, and at Fernbank on June 28, 1971, is 101 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing

degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 40 inches. Of this, 21 inches, or 53 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.73 inches at Cincinnati on March 9, 1964. Thunderstorms occur on about 45 days each year, and most occur in summer.

Average seasonal snowfall is about 17 inches. The greatest snow depth at any one time during the period of record was 16 inches at Cincinnati. On an average of 15 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the south-southwest. Average windspeed is highest, 11 miles per hour, in winter.

Occasionally, tornadoes and severe thunderstorms strike the area. These storms usually are local and of short duration. The pattern of damage caused by these storms is variable.

Physiography

Hamilton County lies in the Till Plains section of the Central Lowland physiographic province (*6*). This province is characterized by structural and sedimentary basins, domes, and arches which came into existence throughout Paleozoic time. Among these features, the Cincinnati geoanticline, or "Cincinnati arch," is structurally significant in southwestern Ohio. Hamilton County is almost at the crest of this arch. The axis of the arch is only several miles east of the metropolitan area. The bedrock underlying the county is shale and fossiliferous limestone of Middle and Late Ordivician age, the oldest in Ohio. It outcrops on steep valley walls and at numerous waterfalls. In other areas it is overlain by glacial deposits that range in thickness to as much as 400 feet.

The county is part of an upland plain rising some 960 feet above sea level. All of the county drains into the Ohio River and its tributaries, mainly the Great Miami and Little Miami Rivers. The Ohio River crosses the area in a valley some 500 feet below the general level of the plain.

The main local physiographic features are gently rolling glacial uplands, steep hillsides along the major streams, extensive glacial river terraces and outwash plains, and flood plains. The maximum relief in the county is 507 feet. The altitude varies from about 962 feet, at the Mt. Airy water tower, which is at the intersection of Colerain Road and North Bend Road, to about 455 feet, at the mouth of the Great Miami River, which is near the southwestern corner of Ohio.

Near the larger streams the land is hilly, made so by numerous tributary stream valleys that vary greatly in length; some are 10 miles or more in length, and some are mere ravines. As a rule, there is little flat upland between these smaller valleys. Back a few miles from the larger streams, the tributary valleys are not so numerous and not so deep and there are broad, rolling uplands such as those at Mt. Healthy and Blue Ash.

Because of the almost horizontal attitude of the underlying bedrock, no local surface feature is outstanding. The most striking feature is the breadth of the Miami and Whitewater River Valleys considering the size of their streams. These valleys are broad, flat-bottomed depressions flanked on either side by relatively steep bluffs rising 200 to 500 feet above the general level of the valley floor. The valley floors are low enough to be subject to floods and are covered by a thin veneer of recent alluvium. These broad valleys are the remnants of valleys that existed prior to Pleistocene glaciation and were partly filled with glacial drift. In some places the present stream follows the course of the ancient stream, but at a much higher elevation.

Preglacial drainage

Geological evidence indicates that there were three major preglacial streams in the area (*5*). The present primary stream, the Ohio River, headed at Manchester and from the east flowed northward through part of what is now the Little Miami Valley to the vicinity of Red Bank, and thence it flowed generally westward across the Norwood Trough to about Elmwood Place. There it merged with the Licking River, which entered the area from the south, and together these streams flowed northward through the present basin of Mill Creek Valley to a junction with the Great Miami River south of Hamilton. From this point, the main stream took a northeasterly course up the Great Miami River Valley, where it joined the Teays, a large preglacial river flowing northwestward across Ohio.

Following glaciation and the blocking of the old channel south of the Norwood Trough by ice and glacial deposits, the Ohio River cut a new course following generally its present alinement. The old abandoned waterway in the Mill Creek Valley became a relatively small stream and reversed its direction southward into the present Ohio River.

Glaciation

Pleistocene glacial invasions preceded and followed by stream erosion provided the county with its rolling, hilly terrain. Water flowing southward from the melting

and retreating glaciers carried debris from glacial moraines and filled the ancient valleys and relocated riverbeds. This debris, which we call glacial outwash, consisted of sand, silt, gravel, cobbles, and boulders. The retreating glaciers also dropped onto the rock base large deposits of ground-up rock and soil material, which we call glacial till. Stream erosion dissected the unconsolidated glacial deposits, producing gently undulating surfaces and exposing, in places, the alternating layers of gently dipping soft shales and limestones.

At least three continental glaciers—the Kansan, the Illinoian, and the Wisconsinan (fig. 1)—invaded the survey area (*7*). The occurrence of these glaciers is manifested by three tills. The oldest till is probably Kansan in age, and the next oldest is Illinoian. The youngest of the three tills was deposited during the Tazewell or Iowan substage of the Wisconsinan stage.

Mineral resources

Sand and gravel deposits important for the construction industry are the predominant mineral resources extracted currently in the county. Principal deposits are along the Great Miami and Whitewater Rivers, in Mill Creek Valley, and along the Little Miami River, particularly east of Newtown.

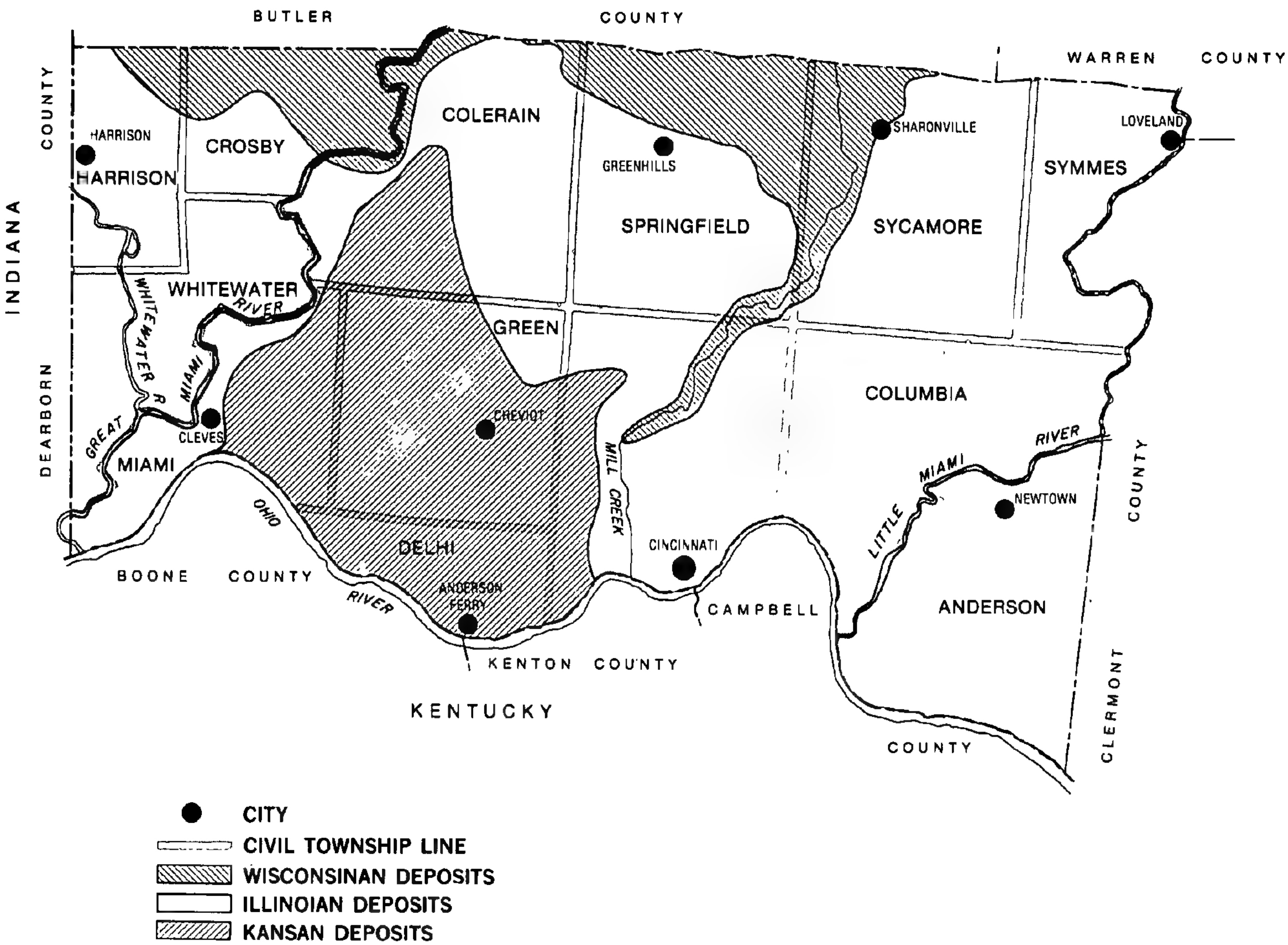

Figure 1.—The major glacial deposits in Hamilton County.

Although not presently extracted on a large scale, limestone, clay, building sand, and molding sand can be produced in limited areas of the county.

Water supply

The main source of water for Hamilton County and the city of Cincinnati is the Ohio River. Over 100 million gallons is taken daily from the Ohio River by means of a submerged intake crib near the Kentucky shore opposite the suburb of California. An additional 40 million gallons per day is pumped from the Miami Valley aquifer by 10 wells averaging 120 feet in depth. These wells, at the Bolton plant in Fairfield, furnish water to the areas of Colerain Township, Forest Park, Pleasant Run, New Burlington, and Mt. Healthy.

The Cincinnati Water Works, owned and operated by the city of Cincinnati, serves 23 municipalities and villages and most of the unincorporated area of the county. It also serves part of Butler County and part of Warren County.

The preglacial river valleys, which are filled with glacial drift to a depth of 200 to 400 feet, are an important source of ground water. The glacial drift consists of intermittent layers of sand, sand and gravel, silt, and clay. Most of this water-sorted and stratified drift is permeable.

Before pumpage, these aquifers were filled and there were many artesian wells. Heavy pumpage of some of the reservoirs, such as the Norwood Trough and the Mill Creek Basin, has substantially lowered the water table. Cincinnati and industries in the area now secure water from the Miami River Basin in Butler County. There is presently little pumpage in the Lower Miami Valley or in the Whitewater Valley. These areas are potentially significant sources of ground water. They also are potentially important for energy conservation. Heat pumps utilizing the heat contained in ground water are proving to be more reliable and efficient than air-to-air heat pumps.

The aquifers are recharged by precipitation and by floodwaters of streams traversing these glacial deposits. Preservation of the flood plains is therefore a requirement of an adequate ground water supply. In this urbanizing county, however, where the choicest land was developed years ago, pressure to develop flood plains increases every year.

The water supply in bedrock is very small. The dominant rocks in the area are the Ordovician shale and the interbedded limestone. The clay shale is very impermeable. The interbedded limestone is fossiliferous and dense, lacking much pore space for water storage. This formation generally does not supply enough water even for domestic use.

Land use

By 1975, more than 55 percent of the county's total area of 265,152 acres was Urban land, and residential development was the dominant urban use. Of the land undeveloped by that year, more than 60 percent remained woodland because of the severity of topography. That information was gathered in a survey by the Ohio-Kentucky-Indiana Regional Council of Governments (*10*).

The urbanized area extends outward from the core of Cincinnati, along major transportation arteries. The central part of the county, running north to south through the Mill Creek Valley, is entirely urbanized.

The pattern of urban development in Hamilton County has been influenced greatly by the major streams. The streams were the major transportation routes as well as sources of water, and their flood plains and valley floors were easily developed by early technology. They determined the location of land transportation routes, which affected subsequent urban development.

Two major land use concerns are reported in the current Master Plan (*9*) for Hamilton County, which was devised to show the optimum pattern of land use for the projected 1990 population of 1,300,000 persons. The first concern is a shortage of prime sites for industrial use because of competition by residential development. The second is the effect of slope and poor natural drainage on residential development.

Transportation

Four interstate roads serve the county. Cincinnati is linked to Cleveland and Louisville via I-71, to Indianapolis and Chicago via I-65, and to Northern Michigan and Southern Florida via I-75. The I-275 circle freeway encompasses the Tri-state metropolitan area.

Commercial air service for Cincinnati (Hamilton County) is provided by Greater Cincinnati Airport, located in Boone County, Kentucky, some 17 minutes from downtown Cincinnati. Seven major airlines provide daily flights between Cincinnati and seventy major cities. Two airports for private craft are in Hamilton County.

The county is served by six major railroads. Four cross-country passenger trains stop daily at a station about 1 mile from downtown Cincinnati.

Twenty-nine barge and towing companies carry bulk products to and from Cincinnati on the Ohio River. Six barge and towing companies, including the largest inland water carrier in the world, are located in Cincinnati. Nine public river terminals are located along Cincinnati's 22 miles of riverfront.

Farming

Most of the farming in Hamilton County is west of the Great Miami River. Some row crops and specialty crops are grown in the Little Miami River Valley.

In 1979, Hamilton County had 490 farms and 47,000 acres of farmland (*18*). The average farm size was 100 acres. The relative importance of the eight major farm commodities, by percent of cash receipts, was as follows: greenhouse and nursery products, 58 percent; vegetables, 8 percent; corn, 7 percent; dairy products, 6 percent; soybeans, 6 percent; cattle, 5 percent; other livestock, 3 percent; and fruit, 2 percent (*4*). In 1980, Hamilton County ranked sixth among Ohio counties for total cash receipts from greenhouses and nurseries.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

General soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit, or association, on the general soil map is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other associations but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The associations in this survey have been grouped into seven general kinds of areas for broad interpretative purposes. Each of the broad groups, and the associations within each group, are described in the following pages.

Soil descriptions

Strongly sloping to very steep soils; on uplands

The soils in this group cover about 25 percent of the county. They are moderately deep and deep, strongly sloping to very steep, and well drained and moderately well drained. These soils are on ridges and hillsides and are used mainly as pasture and woodland. They are moderately well suited to generally unsuited to use as cultivated cropland, pasture, and sites for buildings. These soils are moderately well suited or well suited to trees. Slope, hillside slippage, moderate depth to bedrock, and slow or very slow permeability are the main land use limitations.

1. Eden-Pate association

Moderately deep and deep, strongly sloping to very steep, well drained and moderately well drained moderately fine textured soils; on uplands

This association is on ridges and hillsides (fig. 2). Areas are several miles long. Slope ranges from 8 to 60 percent.

This association makes up about 25 percent of the county. It is about 75 percent Eden soils, 10 percent Pate soils, and 15 percent soils of minor extent.

The Eden soils are on the ridges and on the steeper part of the hillsides, generally near the top of the slope, and the Pate soils are on the colluvial positions at the base of the slope. The Eden soils are moderately deep to shale and limestone bedrock and are well drained, strongly sloping to very steep, and slowly permeable. The Pate soils are deep, moderately well drained, strongly sloping to steep, and very slowly permeable. The Eden and Pate soils have a silty clay loam surface layer and a dominantly silty clay subsoil. They are highly susceptible to hillside slippage.

Of minor extent in this association are Switzerland soils, which are more silty in the upper part of the subsoil and are on shoulder slopes. Also of minor extent are Genesee and Lanier soils on narrow flood plains, Martinsville soils on terraces and outwash plains, and some areas of Urban land.

The soils in this association are used mainly as pasture and woodland. In a few areas the less sloping soils are used as sites for buildings, and in a few areas the soils are used for extensive recreation facilities. The soils in this association are moderately well suited to generally unsuited to use as cultivated cropland, pasture, and building sites and are generally unsuited to use as septic tank absorption fields. They are moderately well suited or well suited to trees.

The slope limits tree planting and logging. Logging roads and skid trails should be laid out across the slope to reduce erosion. Plant competition can be reduced by spraying, girdling, or mowing. The high clay content of the subsoil limits the species of trees that can be planted.

The soils are very unstable and are subject to hillside slippage, especially in cut and filled areas. Intercepting and diverting surface and ground water help prevent slippage. The interbedded limestone and shale in the substratum of the Eden soils are rippable with heavy equipment and rarely require blasting. Runoff and erosion increase if the soils are disturbed by construction; therefore, a plant cover should be maintained on the site as much as possible during construction to reduce soil loss.

Figure 2.—Typical landscape of the Eden-Pate association. Martinsville soils are in the foreground.

Nearly level to very steep soils, and Urban land; on uplands

The four associations in this group cover about 53 percent of the county. The soils are deep, nearly level to very steep, well drained and moderately well drained, and medium textured. These soils are on hillsides, crests of ridges, and flats on uplands. In most areas the soils are in urban uses; in some areas they are used as cropland, pasture, and woodland. Slope, very slow permeability, high shrink-swell potential, and seasonal wetness are the main land use limitations.

2. Bonnell-Rossmoyne-Cincinnati association

Deep, gently sloping to very steep, well drained and moderately well drained medium textured soils; on uplands

This association is on high terrace remnants along the sides of valleys. These areas are the remains of the Illinoian till that partly filled the valleys.

This association makes up about 1 percent of the survey area. It is about 35 percent Bonnell soils, 20 percent Rossmoyne soils, 10 percent Cincinnati soils, and 35 percent soils of minor extent.

The Bonnell soils are on the steeper parts of the landscape, along waterways, and the Rossmoyne and Cincinnati soils are on the higher and less sloping parts. The Bonnell and Cincinnati soils are deep and well drained and have a silt loam surface layer. The Rossmoyne soils are deep and moderately well drained and have a silt loam surface layer. The Bonnell soils are slowly permeable, have high shrink-swell potential in the subsoil, and have moderate frost-action potential. They are moderately steep to very steep. The Rossmoyne and Cincinnati soils have a fragipan and are moderately permeable above the pan and slowly permeable in and below it. They have high frost-action potential. The Rossmoyne and Cincinnati soils are gently sloping and strongly sloping.

Of minor extent in this association are Genesee soils on flood plains and the moderately deep Eden soils on side slopes. Many areas also contain Urban land.

Most of the acreage of this association is in urban uses. In a few areas the soils are used for public parks, and in one large area the soils are used for a cemetery. Most of the steeper soils are in unmanaged woodland. The soils in this association are suited to generally unsuited to lawns, gardens, and sites for buildings. They

are poorly suited to generally unsuited to use as septic tank absorption fields. They are suited to woodland use.

The Cincinnati soils are better suited to use as sites for buildings than the Rossmoyne and Bonnell soils. The slowly permeable fragipan in the Rossmoyne and Cincinnati soils limits their use as septic tank absorption fields. Buildings constructed on Cincinnati and Bonnell soils should be designed to conform to the natural shape of the land. Land shaping is needed in some areas of these soils. Because of wetness, the Rossmoyne soils are better suited to houses without basements than to houses with basements. Drains at the base of footings and exterior basement wall coatings help prevent wet basements in areas of the Rossmoyne soils.

3. Rossmoyne-Urban land-Switzerland association

Deep, nearly level to moderately steep, moderately well drained and well drained medium textured soils, and Urban land; on uplands

This association is on the broad, Illinoian till plains. Many areas of this association cover several square miles.

This association makes up about 35 percent of the county. It is about 50 percent Rossmoyne soils, 20 percent Urban land, 10 percent Switzerland soils, and 20 percent soils of minor extent.

The Rossmoyne soils are mainly on the higher and less sloping parts of the landscape, and the Switzerland soils generally are on the more sloping parts, along waterways. The Rossmoyne soils are deep, moderately well drained, and nearly level to strongly sloping. These soils have a fragipan and are moderately permeable above the pan and slowly permeable in and below the pan. They have a seasonal high water table between depths of 18 and 36 inches. The Switzerland soils are deep, well drained, and gently sloping to moderately steep and are moderately permeable in the upper part of the subsoil and very slowly permeable in the lower part. The Rossmoyne and Switzerland soils have a silt loam surface layer. The Urban land part of this association is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Of minor extent in this association are the somewhat poorly drained Avonburg soils on flats and in depressions and the well drained Bonnell soils, which formed partly in glacial till. Also of minor extent are Cincinnati soils which have a fragipan and are on side slopes along waterways, and the Genesee soils on flood plains.

The soils in this association are used mostly as sites for buildings and recreation facilities. In a few areas they are used as pasture and cropland. The Rossmoyne soils are better suited to most uses than the Switzerland soils. The soils are dominantly moderately well suited as sites for buildings and poorly suited as septic tank absorption fields. They are moderately well suited to use as cropland and well suited to moderately well suited to use as pasture. These soils are suited to woodland and moderately well suited to lawns, flowers, trees, and shrubs.

In areas of the more sloping soils, erosion is a hazard. The surface layer crusts after hard rains. Returning crop residue to the soil and adding other organic matter help to reduce erosion and improve tilth. Soil compaction occurs if the soils are tilled or harvested when wet.

The clayey material in the lower part of the Switzerland soils is difficult to excavate and grade. It is sticky when wet and hard when dry. The steeper areas of these soils are subject to slippage. The Switzerland soils need more reinforcing in the foundations than the Rossmoyne soils. Excavations for foundations for buildings in the Switzerland soils should be backfilled with soil material having low shrink-swell potential. Drains at the base of footings and exterior basement wall coatings help prevent wet basements in areas of these soils. Sanitary facilities are connected to sewers and sewage treatment facilities in many areas. Septic tank absorption fields can be improved by increasing the size of the absorption area.

4. Ava-Urban land-Switzerland association

Deep, nearly level to strongly sloping, moderately well drained and well drained medium textured soils, and Urban land; on uplands

This association is on ridge crests and hillsides on the broad Kansan till plain. Most areas of the association cover several square miles.

This association makes up about 9 percent of the county. It is about 50 percent Ava soils, 25 percent Urban land, 20 percent Switzerland soils, and 5 percent soils of minor extent.

The Ava soils mainly are on broad flats, wide ridgetops, and side slopes. The Switzerland soils are on ridge crests and on shoulder slopes. The Ava soils are deep, nearly level to strongly sloping, moderately well drained soils. They have a fragipan, and they are moderately slowly permeable above the fragipan and very slowly permeable in and below the fragipan. These soils have high shrink-swell potential and a seasonal high water table between depths of 24 and 48 inches in spring and other extended wet periods. The Switzerland soils are deep, gently sloping and strongly sloping, well drained soils. They are moderately permeable in the upper part of the subsoil and very slowly permeable in the middle and lower parts. The Ava and Switzerland soils have a silt loam surface layer. The Urban land part of this association is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that classification of the soils is not feasible.

Of minor extent in this association are the moderately deep Eden soils on side slopes and the well drained Bonnell soils that formed partly in glacial till.

The soils in this association are used mostly for building site development. In some areas they are used for recreation facilities, and in a few areas they are used for pasture. The soils in this association are dominantly well suited to moderately well suited to lawns, gardens, cropland, and pasture. They are moderately well suited as sites for buildings, well suited to trees, and poorly suited to septic tank absorption fields.

In the areas used for pasture, grazing when the soils are wet causes compaction and excessive runoff and reduces yields. Proper stocking rates, pasture rotation, and restriction on grazing when the soils are wet help to keep the plants and the soil in good condition.

The use of this association as sites for buildings and septic tank absorption fields is limited by the very slow permeability and high shrink-swell potential of the Switzerland soils and by the high shrink-swell potential and seasonal wetness of the Ava soils. Sanitary facilities are connected to central sewers and treatment facilities in many areas. If these soils are used as sites for buildings with basements, backfilling the excavations for foundations with material that has low shrink-swell potential and reinforcing basement walls and foundations reduce damage caused by shrinking and swelling of the soils. In areas of the Ava soils, drains at the base of footings and exterior basement wall coatings help prevent wet basements. In areas of Ava and Switzerland soils used for local roads, the use of a suitable base material improves soil strength and reduces damage from frost action.

5. Russell-Urban land-Xenia association

Deep, nearly level and gently sloping, well drained and moderately well drained medium textured soils, and Urban land; on uplands

This association is on the Wisconsinan till plains. Most areas are broad and cover several square miles.

This association makes up about 8 percent of the county. It is about 35 percent Russell soils, 15 percent Urban land, 10 percent Xenia soils, and 40 percent soils of minor extent.

The Russell soils are mainly on knolls, and the Xenia soils are on flats and slight rises. The Russell soils are deep, well drained, and moderately permeable. The Xenia soils are deep, moderately well drained, and moderately slowly permeable. These Xenia soils have a seasonal high water table between depths of 24 and 72 inches in spring and other extended wet periods. The Russell and Xenia soils have a silt loam surface layer. The Urban land part of this association is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Of minor extent in this association are the moderately deep Eden soils in the steeper areas and the somewhat poorly drained Fincastle soils in the nearly level or depressional areas. In dissected areas along waterways are the Miamian soils, which have a thinner silt mantle, and the Hennepin soils, which have no silt mantle.

The soils in this association are used mostly for building site development. In some areas they are used as cropland and pasture, and in a few areas they are used as sites for recreation facilities. The soils in this association are suited to moderately well suited as sites for buildings and suited to poorly suited to septic tank absorption fields. They are well suited to cropland, pasture, woodland, lawns, landscaping, and gardens.

If the soils are used as cropland, maintaining the tilth and the organic matter content of the soil and reducing erosion are concerns of management. The surface layer crusts after hard rains. The regular addition of organic matter reduces surface crusting and erosion and helps maintain the organic matter content. If the soils are used as pasture, proper stocking rates, pasture rotation, and restriction on grazing when the soils are wet help to keep the plants and the soil in good condition.

The Russell soils are better suited as sites for buildings than the seasonally wet Xenia soils. Drains at the base of footings and exterior basement wall coatings are used to help prevent wet basements in areas of the Xenia soils. Sanitary facilities are connected to sewers and sewage treatment facilities in many areas. Sites for local roads can be improved by using a base material having low shrink-swell potential.

Nearly level to strongly sloping soils, and Urban land; on terraces and outwash plains

The two associations in this group cover about 8 percent of the county. The soils are deep, nearly level to strongly sloping, and medium and moderately coarse textured. These soils are on terraces and outwash plains. Farming and urban uses are the principal land uses. The soils are well suited to moderately well suited to cropland use. They are suited as sites for buildings.

6. Urban land-Martinsville-Fox association

Urban land and deep, nearly level to strongly sloping, well drained medium textured soils; on stream terraces and outwash plains

This association is on terraces and outwash plains that border some of the larger streams in the county. Most areas are long and narrow, generally less than one-quarter mile wide.

This association makes up about 5 percent of the county. It is about 25 percent Urban land, 20 percent Martinsville soils, 10 percent Fox soils, and 45 percent soils of minor extent.

The Urban land part of this association is covered by streets, parking lots, buildings, and other structures that

so obscure or alter the soils that identification of the soils is not feasible. The Martinsville soils are generally higher in elevation and farther from the streams than the Fox soils. The Martinsville soils are deep, well drained, moderately permeable, and nearly level to strongly sloping soils. They have a deep rooting zone and slow or medium runoff. The Fox soils are deep, well drained, and nearly level and gently sloping soils. Permeability is moderate in the subsoil and rapid or very rapid in the substratum. Runoff is slow or medium. The root zone in the Fox soils is mainly restricted to the moderately deep zone above the sand and gravel.

Of minor extent in this association are the Casco soils, which have a thinner subsoil and are on the steeper terrace breaks, and the Warsaw Variant soils, which have a darker colored surface layer and are nearly level.

The soils in this association are used mostly for urban uses and farming. Corn and soybeans are the major crops. In a few areas the soils are irrigated and are used for truck crops. The soils are well suited to moderately well suited as sites for buildings. They are moderately well suited to well suited to use as cropland and to use as sites for lawns and gardens.

The Martinsville soils are better suited to crops and pasture than the droughty Fox soils. The Martinsville and Fox soils are well suited to crops planted early in spring; however, unless the Fox soils are irrigated, crop yields are reduced during seasons of below-normal rainfall. The soils are suited to irrigation if erosion is controlled. Planting cover crops and incorporating crop residue or other organic matter into the surface layer help maintain tilth and increase the rate of water infiltration.

This association contains some of the better soils in the county for building site development. If the soils are used for sanitary facilities, pollution of underground water is a hazard. Sanitary facilities, therefore, commonly are connected to sewers and sewage treatment facilities. Sites for local roads and streets can be improved by replacing the subsoil of these soils with a suitable base material. Sloughing is a hazard in excavations.

7. Eldean-Princeton association

Deep, nearly level to sloping, well drained medium textured and moderately coarse textured soils; on terraces and outwash plains

This association is on terraces and outwash plains. Some areas of this unit are more than a mile wide.

This association makes up about 3 percent of the county. It is about 40 percent Eldean soils, 15 percent Princeton soils, and 45 percent soils of minor extent.

The Eldean soils are generally lower in elevation and closer to the streams than the Princeton soils. These Eldean soils are deep, well drained, medium textured, and nearly level to sloping. They are moderately or moderately slowly permeable in the subsoil and rapidly or very rapidly permeable in the substratum. They have low or moderate available water capacity and slow to rapid runoff. The Princeton soils are deep, well drained, moderately coarse textured, and nearly level to sloping. These soils have moderate permeability. They have moderate available water capacity and slow and medium runoff.

Of minor extent in this association are the Casco, Martinsville, and Wea soils. The Casco soils have a thinner subsoil and are on slope breaks on terraces. The Martinsville soils are on positions similar to the Princeton soils. The Wea soils have a darker colored surface layer and generally are on similar or slightly higher positions than the Princeton soils.

The soils in this association are used mostly for farming. In a few areas they are irrigated and are used for truck crops. The soils in this association are well suited to moderately well suited to use as cropland and well suited to use as pasture. They are suited as a site for buildings and to grasses, flowers, vegetables, trees, and shrubs.

The nearly level and gently sloping soils in this association are suited to continuous row cropping if a high level of management is used. They dry and warm up early in spring, allowing early planting and grazing. The Princeton soils are subject to soil blowing if cultivated. Returning crop residue or regularly adding other organic material helps to maintain the organic matter content and increase water infiltration. The use of minimum tillage and the use of cover crops are important moisture conservation practices.

This association contains some of the better soils in the county for building site development. The effluent from septic tanks drains freely in both soils; and in areas of the Eldean soils, groundwater pollution is a hazard. Replacing the subsoil with a suitable base material improves sites for local roads. Sloughing is a hazard in excavations.

Nearly level to steep soils, and Urban land; on lacustrine terraces and basins

The soils in this group cover about 2 percent of the county. These soils are deep, nearly level to steep, moderately well drained and poorly drained, and moderately fine textured. They are on lacustrine terraces and basins. The soils are mainly used for industrial sites and farming. Slow permeability, poor natural drainage, slope, and high shrink-swell potential are the major land use limitations.

8. Markland-Urban land-Patton association

Deep, nearly level to steep, moderately well drained and poorly drained moderately fine textured soils, and Urban land; on lacustrine terraces and basins

This association is on low-lying lacustrine terraces and basins in some of the larger valleys in the survey area.

The terraces typically are long and wide, and the basins generally are small and rounded.

This association makes up about 2 percent of the survey area. It is about 25 percent Markland soils, 20 percent Urban land, 15 percent Patton soils, and 40 percent soils of minor extent.

The Markland soils generally are higher in elevation and closer to the uplands than the Patton soils or are on knolls and rises on broad flats. The Markland soils are deep, moderately well drained, slowly permeable, and gently sloping to steep. They have a seasonal high water table between depths of 36 and 72 inches in spring and other extended wet periods. The available water capacity is moderate, and runoff is medium to very rapid. The potential frost action is moderate. The Patton soils are deep, nearly level, and poorly drained. They have a seasonal high water table near or above the surface in spring and other extended wet periods. Permeability is moderate or moderately slow. In these soils,frost action potential is high. Runoff is very slow or ponded. The Urban land part of this association is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Of minor extent in this association are the Genesee and Ross soils on flood plains, and the moderately well drained Xenia soils on the nearby uplands.

The soils in this association are used for industrial sites and farming. The nearly level and gently sloping soils are suited to cropland use; the steeper soils are less suitable. Gently sloping and sloping Markland soils are better suited as sites for buildings than the Patton soils.

Cropland use is limited by the poor natural drainage of the Patton soils and the erosion hazard of the Markland soils. Special practices, such as using a higher proportion of meadow crops in the cropping system, are needed to reduce erosion on the Markland soils. Drainage ditches and subsurface drains improve drainage in the Patton soils. Tilling within a limited range in moisture content is important on both soils because the soils become compacted and cloddy if worked when wet and sticky.

Most sanitary facilities are connected to central sewers and treatment facilities. The soils in this association are better suited to buildings without basements than to buildings with basements. Backfilling along building foundations with a material that has low shrink-swell potential and reinforcing foundations reduce damage caused by the shrinking and swelling of the soils, especially the Markland soils. Building sites on the Patton soils should be landscaped to drain surface water away from foundations.

Gently sloping to steep soils; on terraces

The soils in this group cover about 1 percent of the county. The soils are deep, well drained, moderately permeable, medium textured, and gently sloping to steep. These soils are on high dissected terraces. These terraces are above the steep and very steep bedrock-controlled hillsides. The soils are mainly used for pasture and urban uses. Slope, high potential frost action, and moderate shrink-swell potential in the subsoil are the major land use limitations.

9. Parke association

Deep, gently sloping to steep, well drained medium textured soils; on high terraces

This association is on high dissected terraces. These terraces are above the steep and very steep bedrock-controlled hillsides.

This association makes up about 1 percent of the county. It is about 95 percent Parke soils and 5 percent soils of minor extent.

The Parke soils are deep, gently sloping to steep, medium textured, well drained, and moderately permeable. They have a deep root zone and high available water capacity. The potential frost action is high. Runoff is medium to very rapid.

Of minor extent in this association are the moderately well drained Ava soils on similar or higher positions than the Parke soils and the well drained Switzerland soils on shoulder slopes. Some areas of Urban land are also in this association.

The soils in this association are used mostly for pasture and building site development. The gently sloping soils are well suited to use as cropland, pasture, building sites, and septic tank absorption fields. The steep soils are generally unsuited to these uses.

Erosion is a major concern of management, especially if strongly sloping and moderately steep areas are used for cultivated crops. Using the soils for pasture is very effective in controlling erosion. Using the trash-mulch or no-till seeding method reduces soil loss during reseeding. Proper stocking rates, pasture rotation, and restriction on grazing when the soils are wet help keep the pasture and the soil in good condition.

The use of these soils as building sites is limited by the shrink-swell potential of the soils. This limitation can be overcome by backfilling foundation excavations with material that has low shrink-swell potential and by reinforcing the foundations. If these soils are used as sites for local roads and streets, using a suitable base material improves the strength of the roadbed and reduces damage caused by frost action in the soil.

Nearly level soils, and Urban land; on flood plains

The two associations in this group cover about 8 percent of the county. The soils are deep, nearly level, well drained, and moderately or moderately rapidly permeable. In most areas they are used for farming. In a few areas they are in urban uses. Flooding is a hazard.

Streambank erosion is also a major concern of management.

10. Jules-Stonelick association

Deep, nearly level, well drained medium textured and moderately coarse textured soils; on flood plains

This association is on broad flood plains along some of the major streams. The flood plains generally are long and range from 500 feet to over one mile in width.

This association makes up about 4 percent of the county. It is about 50 percent Jules soils, 25 percent Stonelick soils, and 25 percent soils of minor extent.

The Jules soils are mainly on the higher parts of the flood plain, farthest from the stream; and the Stonelick soils are closest to the stream. All of these soils are subject to flooding; however, the Stonelick soils are the first to be flooded. The Jules soils are deep, nearly level, well drained, and moderately permeable. They have a silt loam surface layer. The Stonelick soils are deep, nearly level, well drained, and moderately rapidly permeable. They have a fine sandy loam surface layer.

Of minor extent in this association are the Genesee soils in some higher overflow channels and the Lanier soils near the confluence with some smaller tributary stream valleys. These soils have more sand and less silt in the root zone.

The soils in this association are used mostly for farming. In some areas they are used for extensive recreation uses. Narrow strips of trees are common along stream channels. These soils are well suited to cropland and trees. They are generally unsuited as sites for buildings and sanitary facilities but are suited to extensive recreation uses, such as hiking trails and golf fairways.

Corn and soybeans are commonly grown on these soils. Flooding in winter and spring usually damages wheat. In areas of the Stonelick soils, which are droughty, the yields of some crops are less in dry years. The Jules and Stonelick soils are well suited to irrigation. Returning crop residue to the soil and regularly adding other organic matter help conserve moisture and maintain the fertility level. Measures to reduce streambank erosion, such as placing rock riprap on streambanks or vegetating streambanks, are needed in some areas.

11. Genesee-Stonelick-Urban land association

Deep, nearly level, well drained medium textured and moderately coarse textured soils, and Urban land; on flood plains

This association is on broad flood plains along some of the major streams in the survey area. These flood plains generally are wide and long.

This map unit makes up about 4 percent of the survey area. It is about 25 percent Genesee soils, 20 percent Stonelick soils, 15 percent Urban land, and 40 percent soils of minor extent.

The Genesee soils generally are on the parts of the flood plain that are farthest from the stream channel and are the highest in elevation. They are occasionally flooded and are among the last soils on the flood plain to become inundated by the floodwater. They are deep, nearly level, well drained, and moderately permeable. They have a loam surface layer. The Stonelick soils generally are on the lowest part of the flood plain and are the closest to the stream channel. They are frequently flooded and the first soils in the flood plain to become inundated by the floodwater. They are deep, nearly level, and well drained and have moderately rapid permeability. They have a fine sandy loam surface layer. The Urban land part of this association is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that the identification of the soils is not feasible.

Of minor extent in this association are the Lanier soils, which are near the confluence with some smaller tributary stream valleys; the Ross soils, which are in high positions near the terraces; and the Jules soils, which are intermingled with the major soils.

The soils in this association are used mostly for farming. In one valley, they are used mostly for urban purposes. In a few areas they are used as sites for extensive recreation facilities. Narrow strips of trees are common along stream channels. The soils are well suited to cropland, pasture, trees, and lawns. They are generally unsuited as sites for buildings and as septic tank absorption fields. In some areas they are suited to extensive recreation uses, such as hiking trails and golf fairways.

Corn and soybeans are commonly grown. Flooding in winter and spring usually damages wheat. In areas of the Stonelick soils, which are droughty, yields of some crops are less in dry years. The Genesee and Stonelick soils are well suited to irrigation. Returning crop residue to the soil and regularly adding other organic matter help conserve moisture and maintain soil fertility. In some areas, a measure such as the use of riprap or the use of plant cover is needed to reduce streambank erosion.

Urban land and nearly level to strongly sloping soils; on flood plains and terraces

The soils in this group cover about 3 percent of the county. These soils are deep, nearly level to strongly sloping, well drained, and medium textured. Permeability is moderate. These soils are on flood plains and terraces. In most areas they are used for urban and industrial uses. In some areas they are used as cropland. Flooding and erosion are major concerns of management.

12. Urban land-Huntington-Elkinsville association

Urban land and deep, nearly level to strongly sloping, well drained medium textured soils; on flood plains and terraces

This association is on flood plains and terraces that are the lowest landscape positions in the survey area. Most areas are less than one-half mile wide.

This association makes up about 3 percent of the county. It is about 45 percent Urban land, 20 percent Huntington soils, 10 percent Elkinsville soils, and 25 percent soils of minor extent.

The Urban land part of this association is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible. The Huntington soils are on flood plains and are nearly level, and the Elkinsville soils are on terraces and are gently sloping and strongly sloping. The Huntington soils and the Elkinsville soils are deep, well drained, and moderately permeable. They have a silt loam surface layer and high or very high available water capacity.

Of minor extent in this association are Casco and Eldean soils, which have sand and gravel in the substratum and are on slope breaks on terraces. Also of minor extent are Pate soils, which are on foot slopes of steep valley walls.

Most of this association is in urban and industrial uses. In some areas the Huntington soils are used as cropland. Narrow strips of trees are common along stream channels. The Elkinsville soils are well suited as sites for buildings, and the Huntington soils generally are unsuited. The Elkinsville and Huntington soils are well suited to lawns, vegetable and flower gardens, trees, and shrubs. The Huntington soils are also well suited to cropland.

Corn and soybeans can usually be grown on the Huntington soils without flood damage. Flooding in winter and spring may damage winter wheat. The surface layer of the Huntington and Elkinsville soils crusts after hard rains. Erosion is a hazard on the Elkinsville soils, especially if the soils are disturbed and left bare.

The use of the Elkinsville soils as sites for buildings is limited by the shrink-swell potential of these soils. Backfilling along building foundations with a material that has low shrink-swell potential and reinforcing foundations reduce damage caused by the shrinking and swelling of the soils. If the Elkinsville soils are used as sites for local roads and streets, using a suitable base material improves the strength of the roadbed and reduces damage caused by frost action in the soil. Most sanitary facilities in this association are connected to sewers and sewage treatment facilities.

Detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Rossmoyne silt loam, 3 to 8 percent slopes, eroded, is one of several phases in the Rossmoyne series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Miamian-Hennepin silt loams, 15 to 25 percent slopes, eroded, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil descriptions

ArA—Ava silt loam, 0 to 3 percent slopes. This deep, nearly level, moderately well drained soil is on broad flats and wide ridgetops. Most areas are irregularly shaped and range from 10 to 200 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is about 77 inches thick. The upper part of the subsoil is yellowish brown, mottled, friable and firm silt loam; the next part is a fragipan consisting of yellowish brown, firm and very firm silt loam; and the lower part is yellowish brown, brown, and strong brown, firm silty clay loam and silty clay. The substratum to a depth of about 131 inches is multicolored, firm silty clay and clay. It is mottled in the middle and lower parts. In some areas the soil does not have a fragipan or has slope of 3 to 8 percent.

Included in mapping, and making up about 15 percent of most areas, are small areas of somewhat poorly drained and poorly drained soils in depressions.

Permeability is moderately slow above the fragipan and very slow in the fragipan. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity is moderate. Runoff is slow. The subsoil is very strongly acid to medium acid. A perched high water table is between depths of 24 and 48 inches in spring and other extended wet periods. This soil has high potential for frost action and is moderately corrosive to steel and highly corrosive to concrete.

This soil is well suited to corn, soybeans, small grain, and grasses and legumes for hay. It dries slowly in spring, and planting is delayed in undrained areas.

Subsurface and surface drains are used. Subsurface drains are more effective if placed above the very slowly permeable fragipan. This soil is subject to surface crusting after hard rains. Additions of organic matter reduce surface crusting and help maintain soil structure.

This soil is well suited to pasture, but it is not well suited to grazing early in spring. Grazing when the soil is wet causes compaction, increases runoff, and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees. Plant competition can be reduced by spraying, mowing, or disking. Species that are selected for planting should be tolerant of a restricted root zone.

In some areas this soil is in urban use. This soil is moderately well suited to use as a site for buildings and poorly suited to use as septic tank absorption fields. Seasonal wetness, very slow permeability in and below the fragipan, and moderate shrink-swell potential limit the soil for these uses. Drainage ditches, subsurface drains, and storm sewers are used to remove excess water from the soil. This soil can be used for septic tank absorption fields if an absorption area that is larger than normal is used or if alternating absorption fields are used. It is better suited to houses without basements than to houses with basements. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. Building sites should be landscaped so surface water drains away from foundations. Backfilling along foundations with a material that has low shrink-swell potential and reinforcing foundations reduce damage from shrinking and swelling of the soil. The use of this soil for local roads and streets is limited by the hazard of frost action in the soil and the low strength of the soil. These limitations can be overcome by providing artificial drainage and by providing suitable base material. Play areas and walkways need special surfacing because the soil is sticky when wet.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

ArB2—Ava silt loam, 3 to 8 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is on convex ridgetops. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are irregularly shaped and range from 10 to more than 100 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 7 inches thick. The subsoil is about 76 inches thick. It is yellowish brown, mottled, friable and firm silt loam in the upper part; a fragipan of yellowish brown, firm and very firm silt loam in the middle part; and yellowish brown, firm silty clay loam in the lower part. In some areas the soil does not have a fragipan or has slope of less than 3 percent.

Included in mapping are a few areas of severely eroded soils that have poor tilth. These soils are along waterways. Also included are a few areas of somewhat poorly drained soils in depressions. The included soils make up about 20 percent of most areas.

Permeability is moderately slow above the fragipan and very slow in the fragipan. Runoff is medium. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is moderate. The subsoil is very strongly acid to medium acid. A perched high water table is between depths of 24 and 48 inches in spring and other extended wet periods. The potential for frost action is high. This soil is moderately corrosive to steel and highly corrosive to concrete.

In a few areas this soil is used as cropland. This soil is well suited to corn, soybeans, small grain, and grasses and legumes for hay. Maintenance of organic matter content and control of erosion are the main management concerns. This soil is subject to surface crusting after hard rains. Additions of organic matter reduce surface crusting and help maintain soil structure. The natural drainage is generally adequate for farming, but random subsurface drains are needed in included areas of wetter soils.

This soil is used mostly as pasture and is well suited to this use. Grazing when the soil is wet, however, causes compaction, increases runoff, and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees. Competition from undesirable vegetation can be reduced by spraying, mowing, or disking. Species that are selected for planting should be tolerant of a restricted root zone.

In some areas this soil is in urban uses. This soil is moderately well suited to use as a site for buildings and poorly suited to use as septic tank absorption fields. Seasonal wetness, very slow permeability in and below the fragipan, and moderate shrink-swell potential limit the soil for these uses. Drainage ditches, subsurface drains, and storm sewers are used to remove excess water from the soil. This soil can be used for septic tank absorption fields if an absorption area that is larger than normal is used or if alternating absorption fields are used. It is better suited to houses without basements than to houses with basements. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. Building sites should be landscaped so surface water drains away from foundations. Backfilling along foundations with a material that has low shrink-swell potential and reinforcing foundations reduce damage caused by the shrinking and swelling of the soil. The use of this soil for local roads and streets is limited by the hazard of frost action in the soil and by the low strength of the soil. These limitations can be overcome by providing artificial drainage and by providing suitable

base material. Play areas and walkways need special surfacing because the soil is sticky when wet.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

ArC2—Ava silt loam, 8 to 15 percent slopes, eroded. This deep, strongly sloping, moderately well drained soil is on the side slopes of drainageways. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is yellowish brown, friable silt loam about 6 inches thick. The subsoil is about 76 inches thick. It is yellowish brown, mottled, friable silt loam in the upper part; a yellowish brown, firm and very firm silt loam fragipan in the middle part; and yellowish brown, firm silty clay loam in the lower part.

Included in mapping are small areas of moderately deep Eden soils and well drained Parke and Switzerland soils that are on similar or lower positions on the landscape. Also included are a few areas of severely eroded soils that have poor tilth. The included soils make up about 15 percent of most areas.

Permeability is moderately slow above the fragipan and very slow in the fragipan. Surface runoff is rapid. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is moderate. The subsoil is very strongly acid to medium acid. The potential for frost action is high. This soil is moderately corrosive to steel and highly corrosive to concrete. The high water table is between depths of 24 and 48 inches in spring and other extended wet periods.

This soil is suited to corn, soybeans, small grain, and grasses and legumes for hay. Erosion is a severe hazard in cultivated areas. The surface layer crusts after hard rains. Adding organic matter to the soil and planting cover crops reduce crusting and erosion.

This soil is used mainly as pasture and is well suited to this use. Grazing when the soil is wet, however, causes compaction, increases runoff, and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees. Plant competition can be reduced by spraying, mowing, or disking. Species that are selected for planting should be tolerant of a restricted root zone. Logging roads and skid trails should be laid out across the slope to reduce erosion.

In some areas the soil is in urban use. This soil is moderately well suited to use as a site for buildings and poorly suited to use as septic tank absorption fields. Land shaping is needed in some areas. The seasonal wetness and very slow permeability, which limit the use of the soil for septic tank absorption fields, can be partly offset by using curtain drains and placing leach lines on the contour. This soil is better suited to houses without basements than to houses with basements. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. Backfilling along foundations of buildings with a material that has low shrink-swell potential and reinforcing foundations reduce damage from the shrinking and swelling of the soil. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. These limitations can be overcome by providing artificial drainage and by using suitable base material. Plant cover should be maintained on the construction site, if possible, to reduce erosion. Play areas and walkways need special surfacing because the soil is sticky when wet.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

AsB—Ava-Urban land complex, 3 to 8 percent slopes. This complex consists of a deep, gently sloping, moderately well drained Ava soil and Urban land. It is on convex ridgetops. Most areas of this complex range from 10 to 1,000 acres in size and contain about 55 percent Ava silt loam and 35 percent Urban land. The areas of Ava soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Ava soil has a surface layer of brown, friable silt loam about 9 inches thick. The subsoil is about 76 inches thick. It is yellowish brown, mottled, friable and firm silt loam in the upper part; a yellowish brown, firm and very firm silt loam fragipan in the middle part; and yellowish brown, firm silty clay loam in the lower part. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed. In a few areas the slope is less than 3 percent.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping are a few small areas, along waterways, of severely eroded soils that have poor tilth. Also included are a few areas of somewhat poorly drained soils in depressions and a few areas of well drained Parke and Switzerland soils near the edge of mapped areas. The included soils make up about 10 percent of most areas.

Most areas of this complex are artificially drained by sewer systems, gutters, and subsurface drains. In areas of the Ava soil that are not artificially drained, a perched high water table is between depths of 24 and 48 inches in spring and other extended wet periods. Permeability is moderately slow above the fragipan, and runoff is medium. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available

water capacity of this zone is moderate. The subsoil is very strongly acid to medium acid. The potential for frost action is high. This soil is moderately corrosive to steel and highly corrosive to concrete.

The Ava soil makes up the parks, open space, lawns, and gardens. It is suited to lawns, vegetable and flower gardens, trees, and shrubs. Subsurface drains are needed in a few areas. Perennials selected for planting should be tolerant of a restricted root zone. The Ava soil is subject to surface crusting after hard rains. Additions of organic matter reduce surface crusting and help maintain soil structure. If the soil is disturbed and left bare, erosion is a moderate hazard. In some areas the soil has been radically altered and is not suited to lawns and gardens because the subsoil material that is exposed has very poor tilth.

This Ava soil is moderately well suited to use as a site for buildings and to use as septic tank absorption fields. Seasonal wetness, very slow permeability in and below the fragipan, and moderate shrink-swell potential limit the soil for these uses. Most sanitary facilities are connected to sewers and sewage treatment facilities. For septic tank absorption fields, an absorption area that is larger than normal or alternating absorption fields can be used to increase the absorption of effluent. This soil is better suited to houses without basements than to houses with basements. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. Building sites should be landscaped so surface water drains away from foundations. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. These limitations can be overcome by providing artificial drainage and using suitable base material. Play areas and walkways need special surfacing because the soil is sticky when wet. Onsite investigation is needed to properly evaluate a site for a specific use.

The Ava soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

AsC—Ava-Urban land complex, 8 to 15 percent slopes. This complex consists of a deep, strongly sloping, moderately well drained Ava soil and Urban land. It is on the side slopes of waterways. Most areas of this complex range from 10 to 100 acres in size and contain about 55 percent Ava silt loam and 35 percent Urban land. The areas of Ava soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Ava soil has a surface layer of yellowish brown, friable silt loam about 6 inches thick. The subsoil to a depth of about 73 inches is yellowish brown, mottled, friable and firm silt loam in the upper part; a yellowish brown, firm and very firm silt loam fragipan in the middle part; and yellowish brown, firm silty clay loam in the lower part. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of most areas, are small areas of well drained Switzerland soils and a few areas, along waterways, of severely eroded soils that have poor tilth.

Most areas of this complex are artificially drained by sewer systems, gutters, and subsurface drains. In areas of the Ava soil that are not artificially drained, a perched high water table is between depths of 24 and 48 inches in spring and other extended wet periods. Permeability is very slow in the fragipan. Surface runoff is rapid. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is moderate. The subsoil is very strongly acid to medium acid. The potential for frost action is high. This soil is moderately corrosive to steel and highly corrosive to concrete.

The Ava soil makes up the parks, open space, lawns, and gardens. It is suited to lawns, vegetable and flower gardens, trees, and shrubs. This soil is subject to crusting after hard rains. Additions of organic matter reduce crusting and help maintain soil structure. If the soil is disturbed and left bare, erosion is a moderate hazard. Subsurface drains are needed in a few areas. Perennials selected for planting should be tolerant of a restricted root zone. In some areas the soil has been radically altered and is not suited to lawns and gardens because the subsoil material that is exposed has very poor tilth.

The Ava soil is moderately well suited to use as a site for buildings and is poorly suited to use as septic tank absorption fields. Seasonal wetness, very slow permeability, shrink-swell potential, and slope limit the soil for these uses. Most sanitary facilities are connected to sewers and sewage treatment facilities. Land shaping has been done in some areas. The seasonal wetness and very slow permeability, which limit the use of the Ava soil for septic tank absorption fields, can be overcome by using curtain drains and larger absorption areas. The Ava soil is better suited to houses without basements than to houses with basements. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. Building sites should be landscaped so surface water drains away from foundations. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil and by the low strength of the soil. These limitations can be overcome by providing artificial drainage and by using suitable base material. Play areas and walkways need special surfacing because the soil is sticky when

wet. Onsite investigation is needed to properly evaluate a site for a specific use.

The Ava soil is in capability subclass IIIe. It is not assigned to a woodland suitability subclass.

AvA—Avonburg silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad flats on till plains. Areas are oval or irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is brown, mottled, friable silt loam about 5 inches thick. The subsoil is about 61 inches thick. The upper part of the subsoil is grayish brown, mottled, friable silty clay loam; the middle part is a fragipan consisting of grayish brown, mottled, firm and brittle silty clay loam and clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 85 inches is yellowish brown, mottled, firm clay loam.

Included in mapping, and making up about 15 percent of most areas, are small areas of moderately well drained Rossmoyne soils on slight rises and small areas of wetter soils in depressions.

In the Avonburg soil, the seasonal high water table is between depths of 12 and 36 inches in winter and in spring and other extended wet periods. Permeability is moderate above the fragipan and very slow in and below the fragipan. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is low. Runoff is slow. The organic matter content is moderately low. This soil is highly corrosive to untreated steel and concrete. The potential for frost action is high.

Most of the acreage is idle. In a few areas the soil is used as pasture and woodland. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It dries slowly in spring, and planting is delayed in undrained areas. Subsurface and surface drains are used. Subsurface drains are more effective if placed above the very slowly permeable fragipan. This soil is subject to surface crusting after hard rains. Additions of organic matter reduce surface crusting and help maintain soil structure.

This soil is moderately well suited to trees. Species selected for planting should be tolerant of wetness and a restricted root zone. Plant competition can be reduced by spraying, mowing, or disking.

In some areas this soil is in urban uses. This soil is poorly suited to use as a site for buildings, sanitary facilities, and some recreation uses. Seasonal wetness and very slow permeability in and below the fragipan severely limit the soil for these uses and for lawns, gardens, and landscaping. Drainage ditches and subsurface drains can be used to lower the seasonal high water table. Subsurface drains are more effective if placed above the very slowly permeable fragipan. This soil is better suited to houses without basements than to houses with basements. Footer drains and exterior basement wall coatings help prevent wet basements. Building sites should be landscaped so surface water drains away from foundations. If this soil is used as septic tank absorption fields, perimeter drains can be used around the absorption fields to help lower the seasonal high water table. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. These limitations can be overcome by using suitable base material and by providing artificial drainage.

This soil is in capability subclass IIw and woodland suitability subclass 3d.

AwA—Avonburg-Urban land complex, 0 to 2 percent slopes. This complex consists of a deep, nearly level, somewhat poorly drained Avonburg soil and Urban land. It is on the broad flats on till plains. Areas of this complex range from 10 to 100 acres in size and contain about 45 percent Avonburg silt loam and 40 percent Urban land. The areas of Avonburg soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the surface layer of the Avonburg soil is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is brown, mottled, friable silt loam about 5 inches thick. The subsoil is about 61 inches thick. The upper part of the subsoil is grayish brown, mottled, friable silty clay loam; the middle part is a fragipan consisting of grayish brown, mottled, firm and brittle silty clay loam and clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 85 inches is yellowish brown, mottled, firm clay loam. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping are small areas of the moderately well drained Rossmoyne soils on slightly raised positions. Also included are areas of this Avonburg soil that are ponded by runoff from adjacent higher areas after heavy rains. The included soils make up about 15 percent of most areas.

Most areas of this complex are artificially drained by sewer systems, gutters, surface ditches, and to a lesser extent, subsurface drains. In areas of the Avonburg soil that are not artificially drained, the water table is between depths of 12 and 36 inches in winter and in spring and other extended wet periods. Runoff is slow. Permeability is moderate above the fragipan and very slow in and below the fragipan. Root growth is mainly

restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is low. The organic matter content is moderately low. This soil is highly corrosive to untreated steel and concrete. The potential for frost action is high.

The Avonburg soil makes up the parks, open space, lawns, and gardens. It is moderately well suited to lawns, gardens, trees, shrubs, and landscaping. Seasonal wetness is the main limitation to these uses. Surface drains can be used to remove excess surface water. Perennials selected for planting should be tolerant of wet soil. Erosion generally is not a problem unless this soil is disturbed and left bare. In some areas the soil has been radically altered and is not as suitable for lawns and gardens. The subsoil material that is exposed in these areas has very poor tilth. It is sticky when wet and hard when dry.

This Avonburg soil is poorly suited to use as a site for buildings, septic tank absorption fields, and some recreation uses. Seasonal wetness and very slow permeability in and below the fragipan severely limit the soil for these uses. Most areas are serviced by sewers. Drainage ditches and subsurface drains can be used. Subsurface drains are more effective if placed above the very slowly permeable fragipan. This soil is better suited to houses without basements than to houses with basements. Footer drains and exterior basement wall coatings help prevent wet basements. Building sites should be landscaped so that surface water drains away from foundations. Foundations and footings should be designed to prevent structural damage caused by frost action in the soil. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil and by the low strength of the soil. These limitations can be overcome by using artificial drainage and suitable base material. Camp areas and playgrounds may require special surfacing because the soil is sticky when wet. Onsite investigation is needed to properly evaluate a site for a specific use.

The Avonburg soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

BoD—Bonnell silt loam, 15 to 25 percent slopes. This deep, moderately steep, well drained soil is on slopes bordering stream valleys of the Illinoian till plain. Most areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 5 inches thick. The subsurface layer is grayish brown, friable silt loam about 6 inches thick. The subsoil is about 41 inches thick. The upper part of the subsoil is yellowish brown and brown, friable silt loam and silty clay loam; the middle and lower parts are brown and yellowish brown, firm and very firm clay and silty clay. The substratum to a depth of about 72 inches is yellowish brown, very firm clay loam. In some areas the loess mantle is thicker.

Included in mapping are small areas of moderately deep Eden soils. Also included are areas of Cincinnati soils, which have a fragipan. The included soils are near the edge of the mapped areas and make up about 15 percent of these areas.

Permeability is slow. The available water capacity is high, and runoff is rapid. This soil has high shrink-swell potential in the subsoil and high corrosivity to steel.

This soil is used as pasture. It is poorly suited to cultivated crops and moderately well suited to pasture plants. The slope severely limits the use of this soil as cropland. Using contour cultivation and returning crop residue to the soil reduce erosion. The use of this soil as pasture helps to control erosion. Grazing when the soil is wet, however, causes compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition. The trash-mulch method of pasture renovation reduces erosion during reseeding.

This soil is used as woodland and is well suited to trees. Many areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, mowing, or disking. Species selected for planting should be tolerant of the high clay content of the subsoil. If possible, logging roads and skid trails should be laid out on the contour.

This soil is poorly suited to use as a site for buildings and septic tank absorption fields and moderately well suited to some recreation uses. The slope is the main limitation to these uses. Land shaping is needed in most areas. Buildings should be designed to conform to the natural shape of the land. Backfilling along building foundations with a material that has low shrink-swell potential and reinforcing foundations reduce damage from the shrinking and swelling of the soil. For septic tank absorption fields, constructing leach lines across the slope reduces seepage of the effluent to the surface of the soil. For local roads and streets, the slope limitation can be reduced by constructing on the contour. Using a suitable base material under local roads and streets improves the strength of the roadbed and reduces damage caused by shrinking and swelling of the soil. Plant cover should be maintained on the site as much as possible during construction to reduce erosion. Paths and trails should be constructed on the contour where possible, and steps should be used where paths go up and down the slope. Most areas are esthetically pleasing and are very beneficial as open space.

This soil is in capability subclass VIe and woodland suitability subclass 2c.

BoE—Bonnell silt loam, 25 to 35 percent slopes. This deep, steep, well drained soil is on slopes bordering stream valleys of the Illinoian till plain. Most areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 4 inches thick. The subsurface layer is grayish brown, friable silt loam about 5 inches thick. The subsoil is about 39 inches thick. The upper part of the subsoil is yellowish brown and brown, friable silt loam and silty clay loam; and the middle and lower parts are brown and yellowish brown, firm clay and silty clay. The substratum to a depth of about 72 inches is yellowish brown, firm clay loam. In some areas the loess mantle is thicker or the slope is more than 35 percent.

Included in mapping are small areas of moderately deep Eden soils. Also included are small areas of Cincinnati soils, which have a fragipan. The included soils are near the edge of the mapped areas and make up about 15 percent of these areas.

Permeability is slow. The available water capacity is high, and surface runoff is very rapid. This Bonnell soil has high shrink-swell potential in the subsoil and high corrosivity to steel.

This soil is used as pasture. It generally is unsuited to cultivated crops and moderately well suited to pasture. Slopes are too steep for the safe operation of farm machinery. Unless an adequate plant cover is maintained, erosion is a severe hazard. Grazing when the soil is wet causes compaction and excessive runoff and reduces yields. The trash-mulch method of pasture renovation reduces erosion during reseeding. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is used as woodland and is well suited to trees. Many areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed. The slope and the high clay content of the subsoil severely limit the use of planting and harvesting equipment. If possible, logging roads and skid trails should be constructed on the contour. Species selected for planting should be tolerant of the high clay content of the subsoil.

This soil is generally unsuited to use as a site for buildings, septic tank absorption fields, and many recreation uses. Because of the steepness of slope, construction for recreation and urban uses is very difficult, and the hazard of erosion is very severe when vegetation is removed. Extensive land shaping is needed for these uses. Paths and trails should be established across the slope, if possible, and steps should be used where the paths go up and down the slope. Most areas are esthetically pleasing and are very beneficial as open space.

This soil is in capability subclass VIe and woodland suitability subclass 2c.

BoF—Bonnell silt loam, 35 to 60 percent slopes. This deep, very steep, well drained soil is on slopes bordering stream valleys of the Illinoian till plain. Most areas are irregularly shaped and range from 10 to 200 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 3 inches thick. The subsurface layer is grayish brown, friable silt loam about 4 inches thick. The subsoil is about 39 inches thick. The upper part of the subsoil is yellowish brown and brown, friable silt loam and silty clay loam; and the middle and lower parts are brown and yellowish brown, firm clay and silty clay. The substratum to a depth of about 72 inches is yellowish brown, firm clay loam.

Included in mapping, and making up about 15 percent of most areas, are a few areas of moderately deep Eden soils. These included soils are near the edge of the mapped areas.

Permeability is slow. The available water capacity is high, and runoff is very rapid. This soil has high shrink-swell potential in the subsoil and high corrosivity to steel.

This soil is generally unsuited to cultivated crops and pasture because of the very steep slopes.

This soil is used mainly as woodland and is suited to trees. Many areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, or girdling. The slope and high clay content of the subsoil severely limit the use of planting and harvesting equipment. If possible, logging roads and skid trails should be constructed on the contour. Species selected for planting should be tolerant of the high clay content of the subsoil.

Because of the very steep slopes and high clay content of the subsoil, this soil generally is unsuited to use as a site for buildings, septic tank absorption fields, and many recreation uses. Paths and trails should be established across the slope, if possible, and steps should be used where the paths go up and down the slope.

This soil is in capability subclass VIIe and woodland suitability subclass 2c.

CcC2—Casco gravelly loam, 8 to 15 percent slopes, eroded. This deep, strongly sloping, well drained soil is on slope breaks between different terrace levels and on low ridges and hummocks on outwash terraces. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas on slope breaks are long and narrow, and those on hummocks and ridges are oval or rounded. The areas range from 3 to 50 acres in size.

Typically, the surface layer is dark brown, friable gravelly loam about 5 inches thick. The subsoil is about 12 inches thick. The upper part of the subsoil is dark yellowish brown, firm clay loam; and the lower part is dark brown, friable gravelly clay loam. The substratum to a depth of about 60 inches is brown, loose very gravelly sand.

Included in mapping, and making up about 15 percent of most areas, are narrow strips of soils that have slope of less than 8 percent. These included soils are on foot slopes.

Permeability is moderate in the subsoil and very rapid in the substratum of this Casco soil. The available water capacity is low. The surface layer and subsoil are mildly alkaline or neutral.

This soil is used mostly as pasture, but in some areas it is used as cropland. It is moderately well suited to grasses and legumes for hay and pasture. It is poorly suited to corn, soybeans, wheat, oats, and specialty crops. Controlling erosion, maintaining the organic matter content, and increasing the available water capacity of the soil are major management concerns. The soil is very droughty, and yields of most crops are drastically reduced during seasons of below-normal rainfall. Using meadow and hay crops in the cropping system helps increase the organic matter content and reduce erosion.

This soil is moderately well suited to trees. It is better suited to deep-rooted trees than to trees that are shallow rooted. Species selected for planting should be tolerant of dry sites. Trees should be planted early in spring to reduce seedling mortality. Constructing logging roads and skid trails on the contour helps to control erosion. Plant competition can be reduced by spraying, mowing, or disking.

This soil is suited to use as a site for buildings. Buildings should be designed to conform to the natural shape of the land. Land shaping is needed in some areas. Underground water supplies can be polluted because of seepage from sanitary facilities. Shoring is generally needed to prevent sloughing during excavation. During construction, plant cover should be maintained on a site to reduce the hazard of erosion. Drought is a hazard for lawns during dry periods, and seedlings should be mulched and watered. The substratum is a good source of sand and gravel.

This soil is in capability subclass IVe and woodland suitability subclass 3s.

CdD—Casco loam, 15 to 25 percent slopes. This deep, moderately steep, well drained soil is on slope breaks between different terrace levels. Most areas are long and narrow and range from 5 to 40 acres in size.

Typically, the Casco soil has a surface layer of dark brown, friable loam about 4 inches thick. The subsoil is about 11 inches thick. The upper part of the subsoil is dark yellowish brown, firm clay loam; and the lower part is dark brown, friable gravelly clay loam. The substratum to a depth of about 60 inches is brown, loose very gravelly sand. In some areas the surface layer is darker.

Included in mapping are small areas of soils that have slope of 5 to 15 percent and a few areas of extremely droughty soils in which the substratum is exposed. The included soils make up about 15 percent of most areas.

Permeability is moderate in the subsoil of this Casco soil and very rapid in the substratum. The available water capacity is low. The surface layer and the subsoil are mildly alkaline or neutral.

In a few areas this soil is used as pasture. It is too steep and droughty for row crops. It is moderately well suited to grasses and legumes for hay and pasture. Erosion is a severe hazard if pasture is reseeded or if adequate plant cover is not maintained. Seeding pasture by the trash-mulch or no-till methods reduces erosion and conserves moisture. It is difficult to establish seedlings during dry periods. Fertilizer is leached from this soil at a moderately rapid rate. The plants generally respond better to small but frequent or timely applications of nutrients than to one large application.

This soil is used mainly as woodland. It is moderately well suited to trees. The low available water capacity of the soil limits woodland growth. Species selected for planting should be adapted to dry sites. Plant competition can be reduced by spraying, mowing, or disking. Logging roads and skid trails should be established across the slope and protected against erosion.

This soil is poorly suited to use as a site for buildings. Land shaping and retaining walls are needed in most areas. Buildings should be designed to conform to the natural shape of the land. Seepage from sanitary facilities can pollute underground water supplies. Shoring is generally needed during excavation to reduce sloughing. Roads and streets should be laid out on the contour. Plant cover should be maintained on the site as much as possible during construction to reduce erosion. The substratum is a good source of sand and gravel.

This soil is in capability subclass VIe and woodland suitability subclass 3s.

CdE—Casco loam, 25 to 35 percent slopes. This deep, steep, well drained soil is on slope breaks between different terrace levels. Most areas are long and narrow and range from 5 to 70 acres in size.

Typically, the surface layer is dark brown, friable loam about 4 inches thick. The subsoil is about 11 inches thick. The upper part of the subsoil is dark yellowish brown, firm clay loam; and the lower part is dark brown, friable gravelly clay loam. The substratum to a depth of about 60 inches is brown, loose very gravelly sand. In some areas, the surface layer is darker.

Included in mapping, and making up about 15 percent of most areas, are narrow strips where the slope is 10 to 25 percent and a few areas where the very gravelly sand substratum is exposed.

Permeability is moderate in the subsoil of this Casco soil and very rapid in the substratum. The available water capacity is low. The surface layer and the subsoil are mildly alkaline or neutral.

This soil is used mainly as woodland. In a few areas it is used as pasture. Generally it is unsuited to cropland use.

This soil is moderately well suited to trees. It is better suited to deep-rooted trees than to trees that are shallow rooted. Species selected for planting should be tolerant of dry sites. Trees should be planted early in spring to reduce seedling mortality. Erosion is a hazard, and logging roads and skid trails should be constructed on the contour wherever possible.

This soil is poorly suited to use as a site for buildings. Land shaping and retaining walls are needed in most areas. Buildings should be designed to conform to the natural shape of the land. Seepage from sanitary facilities can pollute underground water supplies. Shoring is generally needed during excavation to reduce sloughing. A plant cover should be maintained on the site as much as possible during construction to reduce erosion. The substratum is a good source of sand and gravel.

This soil is in capability subclass VIIe and woodland suitability subclass 3s.

CdF—Casco loam, 35 to 70 percent slopes. This deep, very steep, well drained soil is on slope breaks between different terrace levels on outwash terraces. Most areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is dark brown, friable loam about 4 inches thick. The subsoil is about 11 inches thick. The upper part of the subsoil is dark yellowish brown, firm clay loam; and the lower part is yellowish brown, friable gravelly clay loam. The substratum to a depth of about 60 inches is yellowish brown, loose very gravelly sand. In some areas the surface layer is darker.

Included in mapping, and making up about 15 percent of most areas, are narrow strips where the slope is 20 to 35 percent and a few areas where the very gravelly sand substratum is exposed.

Permeability is moderate in the subsoil of this Casco soil and very rapid in the substratum. The available water capacity is low. The surface layer and the subsoil are mildly alkaline or neutral. Runoff is very rapid.

This soil is used mainly as woodland. It is moderately well suited to trees. It is poorly suited to pasture and is generally unsuited to crops. Erosion is a severe hazard, and logging roads and skid trails should be constructed on the contour wherever possible. This soil is better suited to deep-rooted trees than to trees that are shallow rooted. Species selected for planting should be tolerant of dry sites.

This soil is generally unsuited to use as a site for buildings and sanitary facilities. Extensive land shaping would be necessary for these uses. The substratum is a good source of sand and gravel.

This soil is in capability subclass VIIe and woodland suitability subclass 3s.

CnB2—Cincinnati silt loam, 3 to 8 percent slopes, eroded. This deep, gently sloping, well drained soil is on the Illinoian till plains. It is on ridgetops that commonly are less than 300 feet wide. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long and narrow and range from 5 to more than 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 5 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 61 inches thick. The upper part of the subsoil is brown, friable silty clay loam; the middle part is a fragipan consisting of brown, firm clay loam; and the lower part is dark yellowish brown, firm clay loam. The substratum to a depth of about 86 inches is yellowish brown, firm clay loam glacial till. In some places this soil is slightly wetter and has gray mottles in the upper part of the subsoil. In a few areas the slope is 8 to 15 percent.

Included in mapping, and making up about 15 percent of most areas, are small areas of Switzerland soils, which do not have a fragipan.

Permeability is moderate above the fragipan and slow in and below the fragipan. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is low. Runoff is medium. A perched high water table is at a depth greater than 4 feet in winter and in spring and other extended wet periods. The subsoil is very strongly acid to neutral, and the soil is highly corrosive to concrete. The potential for frost action is high.

In a few areas this soil is used as cropland and pasture. It is well suited to corn, soybeans, wheat, and hay. Erosion is a hazard in cultivated areas. The surface layer crusts after hard rains. Using minimum tillage, grassed waterways, and cover crops and regularly adding organic matter reduce surface crusting and erosion.

This soil is well suited to pasture. Overgrazing or grazing when the soil is wet, however, causes compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees. Species selected for planting should be tolerant of a restricted root zone and brief dry periods. Plant competition can be reduced by spraying, mowing, or disking.

This soil is used mainly as a site for buildings. It is suited as a site for buildings and recreation uses, and it is poorly suited to use as septic tank absorption fields. This soil can be used for septic tank absorption fields if an absorption field that is larger than normal is used. Aeration systems commonly are used. The use of this soil as a site for buildings with basements is limited mainly by wetness. The shrink-swell potential of the soil is an additional limitation. Drains at the base of footings and exterior basement wall coatings will help overcome

the wetness limitation. Backfilling along foundations with a material that has low shrink-swell potential and reinforcing basement walls and foundations reduce damage caused by the shrinking and swelling of the soil. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Using suitable base material helps overcome these limitations. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible.

This soil is in capability subclass IIe and woodland suitability subclass 2d.

CnC2—Cincinnati silt loam, 8 to 15 percent slopes, eroded. This deep, strongly sloping, well drained soil is on dissected parts of Illinoian till plains. It is on sides of small waterways and in narrow, long areas adjacent to steeper upland soils. Erosion has removed part of the original surface layer. Most areas range from 5 to 35 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 3 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 63 inches thick. The upper part of the subsoil is dark brown, friable silty clay loam; the middle part is a fragipan consisting of dark brown, mottled, firm clay loam; and the lower part is dark yellowish brown, mottled, firm clay loam. The substratum to a depth of about 86 inches is yellowish brown, mottled firm clay loam glacial till. In some places this soil is slightly wetter and has gray mottling in the upper part of the subsoil.

Included in mapping are small areas of Eden and Switzerland soils at the end of ridgetops and along some drainageways. The Eden soils are moderately deep to bedrock, and the Switzerland soils do not have a fragipan. Also included are a few areas of severely eroded soils that have poor tilth. The included soils make up about 15 percent of most areas.

Permeability is moderate above the fragipan and slow in and below the fragipan. The root zone is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is low. Runoff is rapid. A perched high water table is at a depth greater than 4 feet in winter and in spring and other extended wet periods. The subsoil is very strongly acid to neutral. This soil is highly corrosive to concrete. The potential for frost action is high.

In a few areas this soil is used as cropland and pasture. It is well suited to corn, soybeans, wheat, and hay. Erosion is a hazard in cultivated areas. The surface layer crusts after hard rains. Using minimum tillage and grassed waterways, planting cover crops, and regularly adding organic matter reduce crusting and soil loss.

This soil is well suited to pasture, and in a few areas it is used for this purpose. The use of this soil as pasture helps to control erosion. Overgrazing or grazing when the soil is wet, however, causes compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees, and in a few areas it is used as woodland. Species selected for planting should be tolerant of a restricted root zone and brief dry periods. Plant competition can be reduced by spraying, mowing, or disking.

This soil is used mainly as a site for buildings. It is suited to use as a site for buildings, moderately well suited to recreation uses, and poorly suited to use as septic tank absorption fields. Land shaping is needed in some areas. Buildings should be designed to conform to the natural shape of the land. The use of this soil as a site for buildings with basements is limited by the wetness and the shrink-swell potential of the soil as well as by the slope. Drains at the base of footings and exterior basement wall coatings will help overcome the wetness limitation. Backfilling along foundations with a material that has low shrink-swell potential and reinforcing basement walls and foundations will reduce damage caused by the shrinking and swelling of the soil. This soil can be used as septic tank absorption fields if a larger absorption area than normal is used and if the leach lines are placed across the slope. Aeration systems commonly are used. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. These limitations can be overcome by using a suitable base material. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss.

This soil is in capability subclass IIIe and woodland suitability subclass 2d.

DaB—Dana silt loam, 0 to 4 percent slopes. This deep, nearly level and gently sloping, moderately well drained soil is in swales and on foot slopes on the Wisconsinan till plain. Most areas are linear or irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 30 inches thick. The upper part of the subsoil is brown and dark yellowish brown, friable and firm silty clay loam; and the lower part is yellowish brown and dark yellowish brown, firm clay loam. The subsoil is mottled below about 24 inches. The substratum to a depth of about 60 inches is dark brown, mottled, friable loam glacial till. In some areas the slope is 4 to 6 percent.

Included in mapping, and making up about 15 percent of most areas, are small areas of the somewhat poorly drained Raub soils in depressions.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow or medium. The

organic matter content and the potential for frost action are high. The high water table is between depths of 36 and 72 inches in spring and other extended wet periods.

This soil is used mainly as pasture and cropland. It is well suited to corn, soybeans, wheat, and hay. Row crops can be grown continuously under good management. Erosion is a hazard if the soil is cultivated. The surface layer crusts after hard rains. Using minimum tillage and grassed waterways and planting cover crops help reduce soil loss. Returning crop residue to the soil and regularly adding other organic matter reduce surface crusting and increase fertility. Tillage and harvesting should be performed at optimum soil moisture levels and with equipment that minimizes soil compaction.

This soil is well suited to pasture. Overgrazing or grazing when the soil is wet, however, causes compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is moderately well suited to use as a site for buildings and recreation uses, and it is poorly suited to use as septic tank absorption fields. Extending building foundations to the substratum and backfilling along foundations with a material that has low shrink-swell potential will reduce damage caused by the shrinking and swelling of the soil. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. Building sites should be landscaped so that surface drainage water drains away from foundations and septic tank absorption fields. If this soil is used as septic tank absorption fields, using curtain drains and using a larger absorption area than normal will increase the absorption of effluent. Sites for local roads and streets can be improved by providing artificial drainage and suitable base material to reduce the damage caused by frost action in the soil and by the low strength of the soil.

This soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

EcB2—Eden silty clay loam, 3 to 8 percent slopes, eroded. This moderately deep, gently sloping, well drained soil is in high-lying areas, such as ridge crests and hilltops. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 7 inches thick. The subsoil is about 26 inches thick. The upper part of the subsoil is dark yellowish brown, friable silty clay loam; and the middle and lower parts are olive brown flaggy silty clay. Light gray interbedded limestone and calcareous shale bedrock is at a depth of about 33 inches. In some places, the bedrock is at a depth of 40 to 72 inches. In a few areas, the soil is moderately well drained and has gray mottles in the subsoil.

Included in mapping, and making up about 10 percent of most areas, are narrow strips of Switzerland and Russell soils where bedrock is at a depth greater than 40 inches.

Permeability is slow. Root development is restricted to the moderately deep zone above the shale and limestone bedrock. The available water capacity is low. Runoff is rapid. The organic matter content is low or moderately low.

In some areas this soil is used as cropland. It is moderately well suited to corn, soybeans, wheat, and hay. Erosion is a hazard if the soil is cultivated. Using minimum tillage and grassed waterways and planting cover crops reduce erosion. Tillage within a limited range in moisture content is important. Clods form if the soil is worked when soft and sticky as a result of wetness. Regular addition of organic matter reduces surface crusting and improves tilth.

This soil is used as pasture and is moderately well suited to this use. Grazing when the soil is wet causes compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing during wet periods help keep the pasture plants and the soil in good condition.

This soil is used as woodland and is moderately well suited to trees. Some areas are in native hardwoods. Plant competition can be reduced by good site preparation and by spraying, cutting, or girdling. Species selected for planting should be tolerant of the high clay content of the subsoil.

In some areas this soil is used as a site for buildings. It is poorly suited to that use and generally is unsuited to use as septic tank absorption fields. The interbedded shale and limestone bedrock in the substratum is rippable with heavy equipment and rarely requires blasting. In wet weather, ground water seeps over the bedrock and onto some slopes and into waterways. Seepage into excavations is common on the lower part of slopes. This seepage can also cause wet basements. Drains at the base of footings and exterior basement wall coatings will help prevent wet basements. Excavations for foundations of buildings should be backfilled with soil material having a low shrink-swell potential. The use of this soil as a site for local roads and streets is limited by the low strength of the soil. Using a suitable base material helps overcome that limitation. Sanitary facilities should be connected to sewers and sewage treatment facilities wherever possible. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss.

This soil is in capability subclass IIIe and woodland suitability subclass 3c.

EcC2—Eden silty clay loam, 8 to 15 percent slopes, eroded. This moderately deep, strongly sloping, well drained soil is on hillsides and ridge crests on uplands. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long and narrow or irregularly shaped and range from 5 to 80 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 6 inches thick. The subsoil is about 22 inches thick. The upper part of the subsoil is yellowish brown, friable silty clay loam; the middle part is yellowish brown and light olive brown, firm silty clay; and the lower part is olive brown, firm flaggy clay. Light gray interbedded limestone and calcareous shale bedrock is at a depth of about 28 inches. In some places the surface layer is silt loam.

Included in mapping are narrow strips of Switzerland soils on ridgetops. Also included are severely eroded soils that have a surface layer of olive brown silty clay or clay. These severely eroded soils have poor tilth and commonly are shallow to bedrock. The included soils make up about 10 percent of most areas.

Bedrock is between depths of 20 and 40 inches. Permeability is slow. Root development is restricted mainly to the moderately deep zone above the shale and limestone bedrock. The available water capacity is low. Runoff is very rapid. Reaction ranges from moderately alkaline to slightly acid in the root zone. The organic matter content is low or moderately low.

This soil is used mainly as pasture, but in some areas it is used as cropland. It is moderately well suited to corn, soybeans, wheat, pasture plants, and hay. Erosion is a hazard if the soil is cultivated. Timely tillage is important because clods form if the soil is worked when it is soft and sticky as a result of wetness. In dry years the soil is droughty in summer and fall. Using minimum tillage and grassed waterways and planting cover crops reduce erosion. The use of this soil as pasture is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes compaction, increases runoff, and reduces yields. Proper stocking, pasture rotation, and restricted grazing during wet periods help keep the pasture plants and the soil in good condition.

In some areas this soil is used as woodland. It is moderately well suited to trees. Locating logging roads and skid trails on the contour helps to reduce erosion. Plant competition can be reduced by spraying, mowing, or disking. Species selected for planting should be tolerant of the high clay content of the subsoil.

In some areas this soil is used as a site for buildings. This soil is poorly suited to that use and generally is unsuited to use as septic tank absorption fields. Sanitary facilities should be connected to sewers and sewage treatment facilities wherever possible. The interbedded shale and limestone bedrock in the substratum is rippable with heavy equipment and rarely requires blasting. Ground water seeping over the bedrock and into excavations is a problem on the lower part of most slopes. This seepage can also cause wet basements. Drains at the base of footings and exterior basement wall coatings will help prevent wet basements. Excavations for foundations of buildings should be backfilled with soil material having a low shrink-swell potential. The use of this soil as a site for local roads and streets is limited by the low strength of the soil. Using a suitable base material helps overcome that limitation. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss.

This soil is in capability subclass IVe and woodland suitability subclass 3c.

EcD—Eden silty clay loam, 15 to 25 percent slopes. This moderately deep, moderately steep, well drained soil is on hillsides on uplands. Some areas have hillside slips. Most areas are long and narrow or irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is about 20 inches thick. The upper part of the subsoil is light olive brown, friable silty clay loam; the middle part is yellowish brown and light olive brown, firm silty clay; and the lower part is olive brown and light olive brown, firm flaggy clay. Light gray interbedded limestone and calcareous shale bedrock is at a depth of about 25 inches. In some small areas the surface layer is very dark brown flaggy silty clay loam, and in other areas it is silt loam. In a few areas the soil is deep to bedrock.

Included in mapping are narrow strips of deep Switzerland soils on the upper part of hillsides and small areas of severely eroded soils that typically have a surface layer of olive brown, calcareous clay or silty clay. The severely eroded soils commonly are shallow to bedrock. Also included are narrow gently sloping benches on hillsides and a few small areas of bedrock outcroppings. The inclusions make up about 10 percent of most areas.

Permeability is slow. The root zone is mainly restricted to the 20- to 40-inch-thick zone above the shale and limestone bedrock. The available water capacity is low. Runoff is very rapid. Reaction ranges from moderately alkaline to slightly acid in the root zone. The organic matter content is low or moderately low.

This soil is used as pasture. Some of the less sloping areas had been cultivated and now are in brushy pasture commonly consisting of bluegrass, thornapple, and redcedar. This soil is moderately well suited to pasture. Controlling erosion, maintaining a stand of forage species, and conserving moisture are major concerns of pasture management. If the soil is overgrazed, erosion is a severe hazard. Proper stocking, pasture rotation, and timely application of fertilizer are good management

practices. The use of companion crops or trash-mulch or no-till seeding methods helps reduce erosion.

This soil is poorly suited to cropland use. Timely tillage is important because clods form if the soil is worked when soft and sticky as a result of wetness.

This soil is used as woodland and is moderately well suited to trees. The high clay content of the subsoil limits tree growth and the selection of species to plant. Logging roads and skid trails should be constructed on the contour where possible. Because of the slope, care is necessary in the operation of planting, spraying, and mowing equipment.

This soil is generally unsuited to use as a site for buildings and to use as septic tank absorption fields. Slope and slippage are the main limitations to those uses. Diverting surface water and ground water away from this soil in winter and spring helps prevent slippage. Cut and filled areas are especially subject to slippage. Excavations on the lower part of most slopes are subject to seepage. The interbedded shale and limestone bedrock in the substratum of this soil is rippable with heavy equipment and rarely requires blasting. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss.

This soil is in capability subclass VIe and woodland suitability subclass 3c.

EcE—Eden silty clay loam, 25 to 40 percent slopes. This moderately deep, steep, well drained soil is on hillsides on uplands. Most areas are dissected by shallow drainageways, and many areas have hillside slips. Most areas are long and narrow or irregularly shaped and range from 5 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is about 23 inches thick. The upper part of the subsoil is light olive brown, friable silty clay loam; the middle part is yellowish brown and light olive brown, firm silty clay; and the lower part is olive brown and light olive brown, mottled, firm flaggy clay. Light gray interbedded limestone and calcareous shale bedrock is at a depth of about 28 inches. In some small areas the surface layer is very dark brown flaggy silty clay loam, and in other areas it is silt loam. In a few areas the soil is deep to bedrock.

Included in mapping are narrow strips of Switzerland soils on the upper part of slopes and small areas of severely eroded soils that typically have a surface layer of olive brown calcareous clay or silty clay. The severely eroded soils commonly are shallow to bedrock. Also included are narrow, gently sloping benches on hillsides and small areas of bedrock outcroppings. The inclusions make up about 10 percent of most areas.

Permeability is slow. The root zone is mainly restricted to the 20- to 40-inch-thick zone above the shale and limestone bedrock. The available water capacity is low. Runoff is very rapid. Reaction ranges from moderately alkaline to slightly acid in the root zone. The organic matter content is low or moderately low.

This soil is used as pasture and is moderately well suited to this use. It is generally unsuited to cropland use. Controlling erosion, maintaining a stand of forage species, and conserving moisture are major concerns of pasture management. If the soil is overgrazed, erosion is a severe hazard. Proper stocking, pasture rotation, and timely application of fertilizer are good management practices. Use of companion crops or use of the trash-mulch or no-till seeding methods helps reduce erosion.

This soil is used as woodland and is moderately well suited to trees. The high clay content of the subsoil limits tree growth and the selection of species to plant. Logging roads and skid trails should be constructed on the contour where practical. Because of the slope, care is necessary in the operation of planting, spraying, and mowing equipment. Plant competition can be reduced by spraying or girdling.

This soil generally is unsuited to use as a site for buildings and to use as septic tank absorption fields. Slope and slippage are the main limitations to these uses. Diverting surface water and ground water away from this soil helps prevent slippage. Cut and filled areas are especially subject to slippage. The interbedded shale and limestone bedrock in the substratum of this soil is rippable with heavy equipment and rarely requires blasting. Excavations on the lower part of most slopes are subject to seepage. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss.

This soil is in capability subclass VIIe and woodland suitability subclass 3c.

EdF—Eden flaggy silty clay loam, 40 to 60 percent slopes. This moderately deep, very steep, well drained soil is on hillsides on uplands. It is generally on the upper one-third of slopes. Most areas are dissected by shallow drainageways and have hillside slips. Areas are long and narrow or irregularly shaped and range from 5 to 500 acres in size.

Typically, the surface layer is very dark grayish brown, friable flaggy silty clay loam about 5 inches thick. The subsoil is light olive brown, firm clay about 16 inches thick. Light gray interbedded limestone and calcareous shale bedrock is at a depth of about 21 inches.

Included in mapping are narrow strips of Switzerland soils on the upper part of slopes. Also included are narrow, gently sloping benches on hillsides and many areas of bedrock outcroppings. The inclusions make up about 10 percent of most areas.

Permeability is slow. Root development is mainly restricted to the 20- to 40-inch-thick zone above the shale and limestone bedrock. The available water capacity is very low. Runoff is very rapid. Reaction ranges from moderately alkaline to slightly acid in the

root zone. The organic matter content is low or moderately low.

Most of the acreage is used as woodland. This soil is moderately well suited to trees. It is generally unsuited to cropland and pasture. The high clay content of the subsoil limits tree growth and the selection of species to plant. Planting and harvesting are very difficult. Logging roads and skid trails are difficult to construct, even on the contour. Plant competition can be reduced by spraying or girdling.

Buildings designed to conform to the natural slope of the land were constructed on this soil during the early development of Cincinnati. This soil generally is unsuited to use as a site for buildings and to use as septic tank absorption fields. Slope and slippage are the main limitations to those uses. Diverting surface water and ground water away from this soil helps prevent slippage. Cut and filled areas are especially subject to slippage. The interbedded shale and limestone bedrock in the substratum of this soil is rippable with heavy equipment and rarely requires blasting. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss.

This soil is in capability subclass VIIe and woodland suitability subclass 3c.

EeB—Eden-Urban land complex, 3 to 8 percent slopes. This complex consists of a moderately deep, gently sloping, well drained Eden soil and Urban land. It is on hilltops and the crests of ridges. Areas of this complex range from 5 to 50 acres in size and contain about 60 percent Eden silty clay loam and 30 percent Urban land. The areas of Eden soil and areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Eden soil has a surface layer of dark brown, friable silty clay loam about 7 inches thick. The subsoil is about 26 inches thick. The upper part of the subsoil is dark yellowish brown, friable silty clay loam; and the lower part is olive brown, firm silty clay. Interbedded clay shale and thin strata of fossiliferous limestone are at a depth of about 33 inches. In some places, the soil is 40 to 72 inches deep to bedrock. In a few areas, it is moderately well drained and has some gray mottles in the subsoil. In some places, the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed.

The Urban part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of most mapped areas, are narrow strips of deep Switzerland and Russell soils.

The Eden soil is 20 to 40 inches deep to bedrock. Permeability is slow. Root development is mainly restricted to the zone above the shale and limestone bedrock. Runoff is rapid. Reaction ranges from moderately alkaline to slightly acid in the subsoil.

The Eden soil makes up the parks, open space, lawns, and gardens. It is well suited to trees, moderately well suited to lawns, and poorly suited to gardens. Tillage of gardens within a limited range in moisture content is important. Clods form if the soil is worked when soft and sticky as a result of wetness. The Eden soil is droughty during dry periods. Erosion is a serious hazard if the soil surface is disturbed and left bare. The included small disturbed areas are difficult to vegetate unless blanketed with topsoil. The subsoil material that is exposed in these areas has poor tilth. It is sticky when wet and hard when dry. It also contains numerous pebbles and limestone fragments in some areas.

The Eden soil is poorly suited to use as a site for buildings and generally unsuited to use as septic tank absorption fields. Most sanitary facilities are connected to sewers and sewage treatment facilities. The use of this soil as a site for local roads and streets is limited by the low strength of the soil. Using a suitable base material helps overcome that limitation. The interbedded shale and limestone bedrock in the substratum is rippable with heavy equipment and rarely requires blasting. In wet weather, ground water seeps over the bedrock and onto some slopes and into waterways. This seepage can also cause wet basements. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. Excavations for foundations of buildings should be backfilled with soil material having a low shrink-swell potential. A plant cover should be maintained on a site, if possible, during construction. Homesites should be landscaped so that surface water drains away from buildings. Onsite investigation is essential to properly evaluate a site for a specific use.

The Eden soil is in capability subclass IIIe. It is not assigned to a woodland suitability subclass.

EeC—Eden-Urban land complex, 8 to 15 percent slopes. This complex consists of a moderately deep, strongly sloping, well drained Eden soil and Urban land. It is on side slopes of bedrock-controlled hills. Areas of this complex range from 5 to 70 acres in size and contain about 55 percent Eden silty clay loam and 30 percent Urban land. The areas of Eden soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Eden soil has a surface layer of dark brown, friable silty clay loam about 6 inches thick. The subsoil is about 20 inches thick. The upper part of the subsoil is dark yellowish brown, friable silty clay loam; and the lower part is olive brown, firm silty clay. Interbedded clay shale and thin strata of fossiliferous limestone are at a depth of about 28 inches. In some

places, the soil is 40 to 72 inches deep to bedrock. In a few areas the soil is moderately well drained and has some gray mottles in the subsoil. In some places, the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 15 percent of most areas, are small areas of the deep Switzerland and Miamian soils.

The Eden soil is 20 to 40 inches deep to bedrock. Permeability is slow. Root development is mainly restricted to the zone above the shale and limestone bedrock. The available water capacity is low. Runoff is very rapid. Reaction ranges from slightly acid to moderately alkaline in the subsoil.

The Eden soil makes up the parks, open space, lawns, and gardens. It is well suited to trees, moderately well suited to lawns, and poorly suited to gardens. Tillage of gardens within a limited range in moisture content is important. Clods form if the soil is worked when soft and sticky as a result of wetness. The soil is droughty during dry periods. Erosion is a hazard. It is especially serious when the soil surface is disturbed and left bare. Disturbed areas are difficult to vegetate unless blanketed with topsoil. The subsoil material that is exposed in these areas has poor tilth. It is sticky when wet and hard when dry. It may also contain numerous pebbles and limestone fragments that interfere with mowing and tilling.

The Eden soil is poorly suited to building site development and generally is unsuited to use as septic tank absorption fields. The slope, the slow permeability, and the bedrock at a depth of 20 to 40 inches are the main limitations. Most sanitary facilities are connected to sewers and sewage treatment facilities. The use of this soil as a site for local roads and streets is limited by the low strength of the soil as well as by the slope. Replacing the surface layer and the subsoil with a suitable base material will strengthen the roadbed. The interbedded shale and limestone bedrock in the substratum is rippable by heavy equipment and rarely requires blasting. In wet weather, ground water seeps over the bedrock and onto some slopes and into waterways. Seepage into excavations is common on the lower part of slopes. This seepage can cause wet basements. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. Excavations for foundations of buildings should be backfilled with soil material having a low shrink-swell potential. A plant cover should be maintained on a site, if possible, during construction to reduce erosion. Onsite investigation is essential to properly evaluate a site for a specific use.

The Eden soil is in capability subclass IVe. It is not assigned to a woodland suitability subclass.

EeD—Eden-Urban land complex, 15 to 25 percent slopes. This complex consists of a moderately steep, well drained Eden soil and Urban land. It is on hillsides on uplands. Areas of this complex range from 10 to 100 acres in size and contain about 60 percent Eden silty clay loam and 30 percent Urban land. The areas of Eden soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Eden soil has a surface layer of very dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is about 23 inches thick. The upper part of the subsoil is light olive brown, friable silty clay loam; and the middle and lower parts are yellowish brown and light olive brown flaggy clay. Light gray interbedded limestone and calcareous shale bedrock is at a depth of about 28 inches. In some small areas the surface layer is very dark brown flaggy silty clay loam, and in other areas it is silt loam. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed. In a few areas the soil is deep to bedrock.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of most areas, are narrow strips of Switzerland soils on the upper part of slopes and small areas of severely eroded soils. The severely eroded soils typically have a surface layer of olive brown calcareous clay or silty clay and commonly are shallow to bedrock.

Permeability is slow in the Eden soil. Root development is mainly restricted to the 20- to 40-inch-thick zone above the shale and limestone bedrock. The available water capacity is low. Runoff is very rapid. Reaction ranges from moderately alkaline to slightly acid in the root zone.

The Eden soil makes up the parks, open space, lawns, and gardens. It is well suited to trees and generally unsuited to flowers and vegetables. The slope, erosion hazard, moderate depth to bedrock, and high clay content of the subsoil severely limit the use of the soil for flowers and vegetables. The subsoil material which is exposed in the included areas that have been cut and filled has very poor tilth. It is sticky when wet and hard when dry. Adding organic matter to this soil will aid in establishing and maintaining lawns and gardens.

This Eden soil is generally unsuited to use as a site for buildings and to use as septic tank absorption fields. Slope and slippage are the main limitations to those uses. Diverting surface water and ground water away from the soil in winter and spring helps prevent

landslides. Cut areas are especially subject to landslides. Excavations on the lower part of most slopes are subject to seepage. The interbedded shale and limestone bedrock in the substratum of the Eden soil is rippable with heavy equipment and rarely requires blasting. Onsite investigation is essential to properly evaluate a site for a specific use.

The Eden soil is in capability subclass VIe. It is not assigned to a woodland suitability subclass.

EpA—Eldean loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on stream terraces and outwash plains. Most areas are broad and irregularly shaped and range from 5 to 500 acres in size.

Typically, the surface layer is brown, friable loam about 7 inches thick. The subsoil is about 29 inches thick. The upper and middle parts of the subsoil are brown, friable and firm clay loam; and the lower part is reddish brown, friable gravelly clay loam. The substratum to a depth of about 60 inches is yellowish brown, loose gravelly loamy sand. In a few areas the surface layer contains more gravel.

Included in mapping, and making up about 15 percent of most areas, are areas of Martinsville soils on similar or slightly higher positions on the landscape.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum. The root zone is mainly moderately deep to sand and gravel. The available water capacity is low or moderate, and runoff is slow. The subsoil ranges from medium acid to moderately alkaline. It is highly corrosive to untreated steel.

In most areas this soil is used as cropland. It is well suited to corn, soybeans, wheat, hay, and garden vegetables. Row crops can be grown year after year under a high level of management. The soil dries and warms up early in spring in most years, allowing early planting. This soil is susceptible to drought, but it is suited to irrigation. Returning crop residue to the soil or regularly adding other organic material helps to maintain the organic matter content of the soil and increase the rate of water infiltration. Minimum tillage and use of cover crops are important practices for conserving moisture. This soil is well suited to grazing early in spring.

This soil is well suited to use as a site for buildings and recreation uses. Effluent from septic tank absorption fields drains freely, and pollution of ground water is a hazard. The use of this soil as a site for local roads and streets is limited by the low strength of the soil. Replacing the subsoil with a suitable base material helps strengthen the roadbed. During dry periods, this soil is droughty for lawns. The substratum is a good source of sand and gravel.

This soil is in capability subclass IIs and woodland suitability subclass 2o.

EpB2—Eldean loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is on slope breaks along waterways and on low knolls on stream terraces. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long and narrow and range from 3 to 25 acres in size.

Typically, the surface layer is brown, friable loam about 5 inches thick. The subsoil is about 27 inches thick. The upper and middle parts of the subsoil are brown, friable and firm clay loam; and the lower part is reddish brown, friable gravelly clay loam. The substratum to a depth of about 60 inches is yellowish brown, loose gravelly loamy sand. In a few areas the soil is less eroded. In some areas the surface layer is gravelly loam.

Included in mapping, and making up about 15 percent of most areas, are small areas of Martinsville soils and a few areas of soils that have a clay loam surface layer and medium tilth. The Martinsville soils are on similar or slightly higher positions on the landscape than the Eldean soil.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum. The root zone is mainly moderately deep to sand and gravel. The available water capacity is low or moderate, and runoff is medium. The subsoil ranges from medium acid to moderately alkaline. The organic matter content is moderately low. This soil is highly corrosive to untreated steel.

In most areas this soil is used as cropland. It is well suited to corn, soybeans, wheat, hay, and vegetable crops. It dries and warms up early in spring in most years, allowing early planting. This soil is better suited to early maturing crops than to crops that mature late in summer. The surface layer can be worked throughout a fairly wide range in moisture content; however, it has a greater tendency to crust than uneroded soil. Droughtiness and the erosion hazard are the main limitations for cultivated crops. Minimum tillage, contour tillage, planting cover crops, and returning crop residue to the soil (fig. 3) reduce erosion, conserve moisture, maintain the organic matter content of the soil, and increase the rate of water infiltration.

This soil is well suited to use as a site for buildings and recreation uses. Effluent from septic tank absorption fields drains freely, and pollution of ground water is a hazard. The use of this soil as a site for local roads and streets is limited by the low strength of the soil. Replacing the subsoil with a suitable base material helps strengthen the roadbed. During dry periods, this soil is droughty for lawns.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

EpC2—Eldean loam, 6 to 12 percent slopes, eroded. This deep, sloping, well drained soil is on stream terraces adjacent to flood plains, along

Figure 3.—Leaving crop residue on the surface reduces erosion, conserves moisture, and increases the rate of water infiltration on Eldean loam, 2 to 6 percent slopes, eroded.

waterways, and on slope breaks between terraces. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long and narrow and range from 5 to 20 acres in size.

Typically, the surface layer is brown, friable loam about 5 inches thick. The subsoil is about 25 inches thick. The upper and middle parts of the subsoil are brown, friable and firm clay loam; and the lower part is reddish brown, friable gravelly clay loam. The substratum to a depth of about 60 inches is yellowish brown, loose gravelly loamy sand.

Included in mapping, and making up about 15 percent of most areas, are small areas of Casco soils that are on some terrace breaks and a few areas of severely eroded soils that have a clay loam surface layer and are on shoulder slopes. The soils that have a clay loam surface layer have medium tilth.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum. The root zone is mainly moderately deep to sand and gravel. The available water capacity is low, and runoff is rapid. The subsoil ranges from medium acid to mildly alkaline. The organic matter content is moderately low. This soil is highly corrosive to untreated steel.

In most areas, this soil is used as cropland. It is moderately well suited to corn, soybeans, wheat, and hay. Erosion is a severe hazard if this soil is cultivated. This soil dries and warms early in spring in most years, allowing early planting. It is droughty during extended dry periods. It is better suited to early maturing crops than to crops that mature late in summer. The included soils that have a clay loam surface layer tend to be sticky when wet and hard and cloddy when dry. Minimum tillage, contour stripcropping, planting cover crops, and returning crop residue to the soil help reduce erosion and increase the rate of water infiltration.

This soil is well suited to use as pasture and to grazing early in spring. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and reduces yields. Pasture rotation and restricted grazing when the soil is wet keep the pasture plants and the soil in good condition.

This soil is suited to use as a site for buildings. Buildings should be designed to conform to the natural shape of the land. Land shaping is needed in some areas. The effluent from septic tank absorption fields drains freely and may pollute ground water. The use of this soil as a site for local roads and streets is limited by

the low strength of the soil. Replacing the subsoil with suitable base material will help strengthen the roadbed. During dry periods, this soil is droughty for lawns. The substratum is a good source of sand and gravel. Runoff and erosion increase during construction; therefore, a plant cover should be maintained wherever possible.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

ErA—Eldean-Urban land complex, 0 to 2 percent slopes. This complex consists of a deep, nearly level, well drained Eldean soil and Urban land. It is on stream terraces and outwash plains. Areas of this complex range from 25 to 500 acres in size and contain about 55 percent Eldean loam and 30 percent Urban land. The areas of Eldean soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Eldean soil has a surface layer of brown, friable loam about 7 inches thick. The subsoil is about 29 inches thick. The upper and middle parts of the subsoil are brown, firm clay loam; and the lower part is reddish brown, friable gravelly clay loam. The substratum to a depth of about 60 inches is yellowish brown, loose gravelly loamy sand. In some places, the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 15 percent of the complex, are areas of Martinsville, Warsaw Variant, and Wea soils. The Martinsville and Wea soils commonly are near breaks to the uplands, and the soils of the Warsaw Variant are adjacent to the flood plains.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum. The root zone is mainly moderately deep to sand and gravel. The available water capacity is low or moderate, and runoff is slow. The organic matter content is moderately low or moderate.

The Eldean soil makes up the parks, open space, lawns, and gardens. It is suited to grasses, flowers, vegetables, trees, and shrubs. Perennials selected for planting should be tolerant of dry sites. During dry periods, irrigation is needed for good growth. The included spots of cut or filled land commonly have a gravelly surface layer and poor tilth. Lawns are difficult to establish in these areas. The fill material is so variable that no predictions can be made about its properties.

The Eldean soil is well suited to use as a site for buildings and recreation uses. If it is used as a site for sanitary facilities, pollution of ground water is a hazard. Most sanitary facilities are connected to sewers and sewage treatment facilities. The use of the Eldean soil as a site for local roads and streets is limited by the low strength of the soil. This limitation can be overcome by replacing the subsoil with a suitable base material. Small stones in the surface layer interfere with such intensive recreation uses as baseball diamonds. Sloughing is a hazard in excavations in the Eldean soil.

The Eldean soil is in capability subclass IIs. It is not assigned to a woodland suitability subclass.

ErB—Eldean-Urban land complex, 2 to 6 percent slopes. This complex consists of a deep, gently sloping, well drained Eldean soil and Urban land. It is on stream terraces. Areas range from 5 to 100 acres in size and contain about 55 percent Eldean loam and 30 percent Urban land. The areas of Eldean soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Eldean soil has a surface layer of brown, friable loam about 5 inches thick. The subsoil is about 27 inches thick. The upper and middle parts of the subsoil are brown, firm clay loam; and the lower part is reddish brown, friable gravelly clay loam. The substratum to a depth of about 60 inches is yellowish brown, loose gravelly loamy sand. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed. In a few areas the surface layer is sandy loam.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 15 percent of most areas, are small areas of Martinsville soils. These soils are on similar or slightly higher positions on the landscape.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum of the Eldean soil. The root zone is mainly moderately deep to sand and gravel. The available water capacity is low or moderate, and runoff is medium. The subsoil ranges from medium acid to mildly alkaline. The organic matter content is moderately low.

The Eldean soil makes up the parks, open space, lawns, and gardens. It is suited to grasses, flowers, vegetables, trees, and shrubs. During dry periods, irrigation is needed for good growth. Perennials selected for planting should be tolerant of drought. Erosion is a hazard if the soil is disturbed and left bare. The included spots of cut or filled land commonly have a gravelly surface layer and poor tilth. Lawns are difficult to establish in these areas. The fill material is so variable that no predictions can be made about its properties.

The Eldean soil is well suited to use as a site for buildings and recreation uses. If it is used as a site for sanitary facilities, pollution of ground water is a hazard.

Most sanitary facilities are connected to sewers and sewage treatment facilities. The use of the Eldean soil as a site for local roads and streets is limited by the low strength of the soil. This limitation can be overcome by replacing the subsoil with a suitable base material. Storm sewers are used in many areas to handle storm water runoff. Small stones in the surface layer interfere with such recreation uses as baseball diamonds. Sloughing is a hazard in excavations in the Eldean soil.

The Eldean soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

FdA—Fincastle silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on the broad flats of Wisconsinan till plains. Most areas are oblong or irregularly shaped and range from 3 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 34 inches thick. The upper part of the subsoil is brown, mottled, friable silt loam; the middle part is dark yellowish brown, mottled, firm silty clay loam; and the lower part is dark yellowish brown and dark brown, mottled, firm clay loam. The substratum to a depth of about 70 inches is yellowish brown, mottled, friable loam. In some areas the surface layer is darker.

Included in mapping, and making up about 10 percent of most mapped areas, are small areas of moderately well drained Xenia soils on slight rises.

The seasonal high water table is between depths of 12 and 36 inches in winter and in spring and other extended wet periods. Permeability is slow. The available water capacity is high. Surface runoff is slow. The organic matter content is moderate or moderately low. This soil is highly corrosive to untreated steel. The potential for frost action is high.

In most areas this soil is used as cropland. It is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. It can be used for row crops year after year if management is optimum. It dries slowly in spring, and planting is delayed in undrained areas. Subsurface and surface drains are used. This soil is subject to surface crusting after hard rains. Additions of organic matter reduce surface crusting and maintain soil structure.

Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is moderately well suited to trees. Tree seedlings grow better if competing vegetation is controlled or removed by spraying, cutting, or disking. Species selected for planting should be tolerant of wetness.

Some areas are in urban uses. This soil is poorly suited to building site development and to sanitary facilities, such as septic tank absorption fields. It is moderately well suited to recreation uses. The slow permeability and seasonal wetness limit these uses. Subsurface drains, open ditches, and storm sewers are used to improve drainage and lower the seasonal high water table. This soil is better suited to houses without basements than to houses with basements. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. Building sites should be landscaped so surface water drains away from foundations. Perimeter drains help lower the seasonal high water table around septic tank absorption fields. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil and by the low strength of the soil. These limitations can be overcome by providing artificial drainage and using suitable base material.

This soil is in capability subclass IIw and woodland suitability subclass 3o.

FeA—Fincastle-Urban land complex, 0 to 2 percent slopes. This complex consists of a nearly level, somewhat poorly drained Fincastle soil and Urban land. It is on broad flats on the Wisconsinan till plains. Most areas of this complex range from 10 to 150 acres in size and contain about 60 percent Fincastle silt loam soil and 30 percent Urban land. The areas of Fincastle soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale of mapping used.

Typically, the Fincastle soil has a surface layer of dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 34 inches thick. The upper part of the subsoil is brown, mottled, friable silt loam; the middle part is dark yellowish brown, mottled, firm silty clay loam; and the lower part is dark yellowish brown and brown, mottled, firm clay loam. The substratum to a depth of about 70 inches is yellowish brown, mottled, firm clay loam. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of the complex, are small areas of the moderately well drained Xenia soils on slightly higher positions than this Fincastle soil and a few low lying areas that are subject to ponding by runoff from adjacent higher areas.

Most areas of this complex are artificially drained by sewer systems, gutters, surface ditches, and to a lesser extent, drainage tiles or tubing. The Fincastle soil that is not artificially drained has a seasonal high water table between depths of 12 and 36 inches in winter and in spring and other extended wet periods. Permeability is

slow. The available water capacity is high. Surface runoff is slow. This soil is highly corrosive to untreated steel. The potential for frost action is high.

The Fincastle soil makes up parks, open space, lawns, and gardens. It is moderately well suited to lawns, gardens, trees, and shrubs and to recreation uses. Perennials that are selected for planting should be tolerant of wetness. Soil erosion generally is not a major problem unless the soil is disturbed and left bare or is used as a watercourse. Disturbed areas that have been cut or filled are poorly suited to lawns and gardens. The subsoil material that commonly is exposed has very poor tilth. It is sticky when wet and hard when dry.

The Fincastle soil is poorly suited to use as a site for buildings and sanitary facilities, such as septic tank absorption fields. The slow permeability and seasonal wetness limit these uses. This soil is better suited to houses without basements than to houses with basements. Buildings should be landscaped for good surface drainage away from foundations. Sanitary facilities commonly are connected to sewers and sewage treatment facilities. Septic tank absorption fields should be located on the higher part of the landscape. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil and by the low strength of the soil. These limitations can be overcome by providing artificial drainage and suitable base material. Play areas and walkways may require special surfacing. Onsite investigation is needed to properly evaluate a site for a specific use.

The Fincastle soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

FoA—Fox loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on stream terraces and outwash plains. Most areas are long and narrow or oval and range from 5 to 80 acres in size.

Typically, the surface layer is brown, friable loam about 8 inches thick. The subsoil is about 26 inches thick. The upper part of the subsoil is dark yellowish brown, friable loam; the middle part is brown, friable sandy clay loam; and the lower part is reddish brown, firm gravelly sandy clay loam. The substratum to a depth of about 60 inches is brown, loose very gravelly loamy sand. In some areas the soil has a sandy loam surface layer, a darker surface layer, or less gravel in the substratum.

Permeability is moderate in the subsoil and rapid or very rapid in the substratum. The root zone is mainly moderately deep to sand and gravel. The available water capacity is low, and runoff is slow.

This soil is used mainly as cropland. It is moderately well suited to corn, soybeans, wheat, oats, and specialty crops. Droughtiness is a limitation, and the soil is better suited to early maturing crops than to crops that mature late in summer. This soil is well suited to irrigation. Some areas used for specialty crops are sprinkler irrigated. Unless the soil is irrigated, crop yields are reduced during seasons of below-normal rainfall. Maintaining the organic matter content and increasing the available water capacity are major management concerns. Including meadow crops in the cropping system helps increase the organic matter content. This soil is well suited to grazing early in spring.

This soil is well suited to use as a site for buildings and recreation uses. The effluent from septic tank absorption fields drains freely and may pollute ground water. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil and by the shrink-swell potential of the soil. Replacing the subsoil with a suitable base material helps overcome these limitations. Sloughing is a hazard in excavations. During dry periods, this soil is droughty for lawns. The substratum is a good source of sand, gravel, and roadfill.

This soil is in capability subclass IIs and woodland suitability subclass 2o.

FoB2—Fox loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is on slight rises and on the sides of shallow waterways on stream terraces. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long and narrow or oval and range from 5 to 40 acres in size.

Typically, the surface layer is dark yellowish brown, friable loam about 7 inches thick. The subsoil is about 26 inches thick. The upper part of the subsoil is dark yellowish brown, friable loam; the middle part is brown, friable sandy clay loam; and the lower part is reddish brown, firm gravelly sandy clay loam. The substratum to a depth of about 60 inches is brown, loose very gravelly loamy sand. In some areas the soil has a sandy loam surface layer, a darker surface layer, or a thinner subsoil.

Permeability is moderate in the subsoil and rapid or very rapid in the substratum. The root zone is mainly moderately deep to sand and gravel. The available water capacity is low. Runoff is medium.

This soil is used mainly as cropland. It is moderately well suited to corn, soybeans, wheat, oats, and specialty crops. Droughtiness is a limitation, and the soil is better suited to early maturing crops than to crops that mature late in summer. Some areas used for specialty crops are sprinkler irrigated. Unless the soil is irrigated, crop yields are reduced during seasons of below-normal rainfall. Controlling erosion, maintaining the organic matter content, and increasing the capacity of the soil to hold water are management concerns. Including meadow crops in the cropping system helps increase the organic matter content. This soil is well suited to grazing early in spring.

This soil is well suited to use as a site for buildings and recreation uses. The effluent from septic tank absorption fields drains freely and may pollute ground water. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil

and by the shrink-swell potential of the soil. Replacing the subsoil with a suitable base material helps overcome these limitations. Sloughing is a hazard in excavations. During dry periods, this soil is droughty for lawns. The substratum is a good source of sand, gravel, and roadfill.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

FpA—Fox-Urban land complex, 0 to 3 percent slopes. This complex consists of a deep, nearly level, well drained Fox soil and Urban land. It is on stream terraces and outwash plains. Areas of this complex range from 10 to 200 acres in size and are about 50 percent Fox loam and 35 percent Urban land. The areas of Fox soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Fox soil has a surface layer of brown, friable loam about 8 inches thick. The subsoil is about 26 inches thick. The upper part of the subsoil is dark yellowish brown, friable loam; the middle part is brown, friable sandy clay loam; and the lower part is reddish brown, firm gravelly sandy clay loam. The substratum to a depth of about 60 inches is brown, loose very gravelly loamy sand. In some places, the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed. In a few areas the soil has a darker surface layer, a thinner subsoil, or less gravel in the substratum.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 15 percent of the complex, are small areas of Wea soils in similar or slightly higher positions. These Wea soils have a darker surface layer and are not as droughty as the Fox soil.

Permeability in the Fox soil is moderate in the subsoil and rapid or very rapid in the substratum. The available water capacity is low, and runoff is slow.

The Fox soil makes up the parks, open space, lawns, and gardens. It is moderately well suited to grasses, flowers, and vegetables and is well suited to trees and shrubs. The Fox soil is droughty, and watering is necessary for good growth during dry periods. Perennials that are selected for planting should be tolerant of dry sites. The included spots of cut and filled land commonly consist of calcareous gravelly material that is poorly suited to lawns and gardens. Lawns are difficult to establish in these areas. The fill material is so variable that no prediction can be made about its properties.

The Fox soil is well suited to use as a site for buildings and recreation uses. If it is used for sanitary facilities, pollution of ground water is a hazard. Sanitary facilities commonly are connected to sewers and sewage treatment facilities. The use of the Fox soil as a site for local roads and streets is limited by the hazard of frost action in the soil and by the shrink-swell potential of the soil. Those limitations can be overcome by replacing the subsoil with a suitable base material. Small stones in the surface layer interfere with such intensive recreation uses as baseball diamonds. Sloughing is a hazard in excavations in the Fox soil. The substratum of the Fox soil is a good source of sand, gravel, and roadfill.

The Fox soil is in capability subclass IIs. It is not assigned to a woodland suitability subclass.

Gn—Genesee loam, occasionally flooded. This deep, nearly level, well drained soil is on flood plains. It is subject to occasional brief flooding. Slope is 0 to 2 percent. Most areas are long and narrow and range from 2 to 400 acres in size.

Typically, the surface layer is brown, friable loam about 9 inches thick. The substratum to a depth of about 60 inches is brown, friable loam in the upper part and brown, friable stratified loam and sandy loam in the lower part. In a few areas the soil has a silt loam surface layer, and in a few areas it is slightly wetter and has mottles in the lower part of the subsoil. In a few areas the surface layer is darker or a dark layer is below 2 or 3 feet.

Permeability is moderate. The available water capacity is very high, and runoff is slow. The organic matter content is moderate.

This soil is used mainly as cropland. It is well suited to corn, soybeans, wheat, hay, and specialty crops. Flooding in winter and spring may damage winter wheat, but corn and soybeans can usually be grown without flood damage. This soil is highly fertile; however, regular addition of fertilizer keeps the soil in high production. In some areas, a measure such as the use of riprap or the use of plant cover is needed to reduce streambank erosion.

This soil is well suited to pasture. Overgrazing or grazing when the soil is wet, however, causes compaction and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees, but because of its suitability for cropland use, this soil is used as woodland only in a few areas. This soil is also well suited to use as habitat for openland and woodland wildlife.

This soil generally is not suited to use as a site for buildings and sanitary facilities because of the flood hazard. It is suited to extensive recreation uses, such as golf fairways and hiking trails. This soil is a good source of topsoil.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

Go—Genesee-Urban land complex, occasionally flooded. This complex consists of a deep, nearly level, well drained Genesee soil and Urban land. It is on flood

plains. Flooding may occur at any time of the year, but commonly occurs for brief periods in fall, winter, and spring. Slope is 0 to 2 percent. Areas are 5 to 50 acres in size and contain about 55 percent Genesee loam and 35 percent Urban land. The areas of Genesee soil and the areas of Urban land are so intricately mixed, or so small, that it is not possible to separate them at the scale used in mapping.

Typically, the Genesee soil has a surface layer of brown, friable loam about 9 inches thick. The substratum to a depth of about 60 inches is brown, friable loam in the upper part and brown, friable, stratified loam and sandy loam in the lower part. In a few areas the soil has a darker surface layer. In some places, the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of the complex, are a few small areas of somewhat poorly drained Wakeland soils in slight depressions.

The Genesee soil has moderate permeability and very high available water capacity. Runoff is slow.

The Genesee soil makes up the parks, open space, lawns, and gardens. It is moderately well suited to grasses, flowers, vegetables, trees, and shrubs. The surface layer is easily tilled throughout a wide range in moisture content. The soil is well suited to irrigation. The material in the filled areas is from the subsoil and substratum of soils on uplands and terraces and is very poorly suited to lawns and gardens. This material has poor tilth. It is sticky when wet and very hard when dry.

The Genesee soil is generally unsuitable for building site development and sanitary facilities because of the flood hazard. It is suited to extensive recreation developments, such as golf fairways and hiking trails. Sanitary facilities commonly are connected to sewers and sewage treatment facilities. Storm sewers and gutters are used in most areas. This soil is a good source of topsoil. Onsite investigation is needed to determine the best use of a given site.

The Genesee soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

HeF—Hennepin silt loam, 35 to 60 percent slopes. This deep, very steep, well drained soil is on slopes along streams in dissected parts of the Wisconsinan till plain. Most areas are long and narrow and range from 10 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 2 inches thick. The subsoil is yellowish brown, friable loam about 10 inches thick. The substratum to a depth of about 60 inches is dark yellowish brown, firm loam glacial till.

Included in mapping, and making up about 15 percent of most mapped areas, are small areas of Eden and Miamian soils and a few narrow strips where the slope is less than 35 percent. The Eden soils are 20 to 40 inches deep to bedrock, and the Miamian soils have a thicker subsoil than the Hennepin soil.

Permeability is moderately slow or slow. The available water capacity is moderate, and runoff is very rapid.

In most areas this soil is used as woodland, pasture, and open space. It is unsuitable for cultivated crops and hay and is poorly suited to pasture. Slopes are too steep for safe operation of farm machinery. Erosion is a severe hazard if adequate plant cover is not maintained. Legumes like crownvetch, which are tolerant of droughtiness and high and low lime conditions, can be grown on this soil. Selecting suitable plants, proper stocking, and pasture rotation help keep the pasture plants and the soil in good condition.

This soil is well suited to trees. The steepness of slope severely limits the use of equipment for tree planting and harvesting. Logging roads and skid trails should be constructed on the contour, where possible, and should be protected against erosion. Plant competition can be reduced by cutting, spraying, or girdling.

This soil is unsuitable as a site for buildings, sanitary facilities, and most recreation uses. Construction for these uses is very difficult, and the hazard of erosion is very severe if vegetation is removed. Most areas are esthetically pleasing and are very beneficial as open space.

This soil is in capability subclass VIIe and woodland suitability subclass 1r.

HoA—Henshaw silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on flats and slight rises on low stream terraces and in lacustrine basins. Most areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is yellowish brown and grayish brown, mottled, friable and firm silty clay loam about 36 inches thick. The substratum to a depth of about 66 inches is grayish brown and gray, mottled, firm silty clay loam. In a few areas the surface layer is loam.

Included in mapping, and making up about 15 percent of most areas, are small areas of poorly drained Patton soils in depressions and moderately well drained Markland soils on rises.

This Henshaw soil has a high water table in the upper part of the subsoil in winter and in spring and other extended wet periods. Permeability is moderately slow, available water capacity is high, and runoff is slow. The organic matter content is moderately low or moderate. The soil is highly corrosive to unprotected steel. The potential for frost action in this soil is high.

This soil is used as cropland. It is well suited to corn, soybeans, wheat, and hay. Seasonal wetness is the main limitation to farming. Surface drains are used to remove excess surface water, and subsurface drains commonly are used to lower the seasonal high water table. The surface layer crusts after hard rains. Returning crop residue to the soil and regularly adding other organic matter increase fertility and reduce soil crusting. Tillage and harvesting operations are best performed at optimum soil moisture levels and with equipment that minimizes soil compaction.

This soil is suited to pasture, but because of wetness it is not suited to grazing early in spring. Grasses that are water tolerant are best for new seedings. Grazing when the soil is wet causes compaction and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is used as a site for buildings. It is poorly suited to use as a site for buildings and septic tank absorption fields, and it is moderately well suited to recreation uses. The moderately slow permeability and seasonal wetness limit these uses. This soil is better suited to houses without basements than to houses with basements. Drains at the base of footings and exterior basement wall coatings will help prevent wet basements. Drainage ditches and subsurface drains can lower the high water table where suitable outlets are available. Building sites should be landscaped so surface water drains away from foundations and septic tank absorption fields. Perimeter drains help lower the seasonal high water table around septic tank absorption fields. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil and by the low strength of the soil. These limitations can be overcome by using suitable base material and artificial drainage.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

Hu—Huntington silt loam, occasionally flooded. This deep, nearly level, well drained soil is on flood plains. It is generally at the highest elevation on the flood plain. Flooding can occur at any time of the year, but commonly occurs for brief periods in winter and spring. Slope is 0 to 2 percent. Most areas are broad and range from 20 to 500 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 11 inches thick. The subsoil is about 57 inches thick. The upper part of the subsoil is brown, friable silt loam; and the middle and lower parts are dark brown, firm silty clay loam. The substratum to a depth of about 80 inches is dark brown, friable loam. In a few areas there is less clay between depths of 10 and 40 inches. In some areas, the surface layer is lighter colored.

This soil has a seasonal high water table between depths of 48 and 72 inches in winter and in spring and other extended wet periods. It has moderate permeability and high or very high available water capacity. Runoff is slow. The root zone is deep and slightly acid to mildly alkaline. The potential for frost action is high.

This soil is well suited to cropland use, and in most areas it is used for corn, soybeans, wheat, and hay or for bluegrass sod. Corn and soybeans can usually be grown without flood damage. Flooding in winter and spring may damage winter wheat. This soil has good tilth and is well suited to irrigation. The surface layer crusts after hard rains. In some areas, a measure such as the use of riprap or the use of plant cover is needed to reduce streambank erosion.

This soil is also well suited to pasture. Overgrazing or grazing when the soil is wet, however, causes compaction and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees and to habitat for openland and woodland wildlife. Only a few areas are wooded. Floodwater generally does not damage trees. Plant competition can be reduced by such practices as spraying, mowing, or disking.

This soil is generally unsuitable for use as a site for buildings, sanitary facilities, and intensive recreation uses. It is a good source of topsoil. This soil is suited to extensive recreation uses, such as golf fairways and hiking trails. Special measures are needed in some areas to keep streams from forming new channels.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

Ju—Jules silt loam, occasionally flooded. This deep, nearly level, well drained soil is on flood plains. It is generally near slope breaks to uplands or outwash terraces. Flooding may occur at any time of the year, but commonly occurs for brief periods in spring. Slope is 0 to 2 percent. Most areas are broad and range from 10 to 2,500 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The substratum to a depth of about 60 inches is brown and dark yellowish brown, friable silt loam.

Included in mapping are small areas of somewhat poorly drained Wakeland soils in low, level oxbows. Also included are narrow strips of Stonelick soils in slightly lower areas. These included soils make up about 15 percent of most areas.

Permeability is moderate. The root zone is deep and mildly alkaline or moderately alkaline. The available water capacity is very high, and runoff is slow. The organic matter content is moderately low. The potential for frost action is high.

In most areas this soil is used as cropland. It is well suited to corn, soybeans, wheat, and hay (fig. 4). Corn and soybeans can usually be grown without flood damage. The occasional spring floods may damage

wheat. This soil has good tilth and is well suited to irrigation. The surface layer crusts after hard rains.

This soil is also well suited to pasture. Overgrazing or grazing when the soil is wet, however, causes compaction and reduces yields. Proper stocking, pasture rotation, and restriction on grazing when the soil is wet help keep the pasture plants and the soil in good condition. In some areas, a measure such as the use of riprap or the use of plant cover is needed to reduce streambank erosion.

This soil is well suited to trees and to habitat for openland and woodland wildlife. Only a few areas are wooded. Floodwater generally does not damage trees. Plant competition can be reduced by such practices as spraying, mowing, or disking.

This soil is generally unsuitable for use as a site for buildings, sanitary facilities, and intensive recreation uses. It is a good source of topsoil. This soil is suited to extensive recreation uses, such as golf fairways and hiking trails. Special measures are needed in some areas to keep streams from forming new channels.

This soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

Lg—Lanier sandy loam, occasionally flooded. This deep, nearly level, well drained soil is on flood plains. Flooding may occur at any time of the year, but commonly occurs for brief periods in winter and spring. Slope is 0 to 2 percent. Most areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable sandy loam about 6 inches thick. The subsurface layer is dark brown, friable sandy loam about 11 inches thick. The substratum to a depth of about 72 inches is dark brown, loose, stratified very gravelly loamy sand.

Permeability is rapid or very rapid, and the available water capacity is low. Runoff is slow.

This soil is used mainly for woodland, pasture, and cultivated crops. It is suited to corn, soybeans, wheat, and hay and to pasture plants. The yield of some crops is reduced in dry years, however, because of the droughtiness of the soil. This soil is suited to irrigation, and measures to conserve soil moisture will benefit most crops. The occasional flooding damages winter wheat; however, crops like corn and soybeans can usually be grown without flood damage. Regular addition of organic matter helps conserve soil moisture and increase the fertility level. The use of cover crops protects the surface

Figure 4.—Jules silt loam, occasionally flooded, is prime farmland and is well suited to corn. Eden silty clay loam, 15 to 25 percent slopes, is on the slope in the background.

during floods. In some areas, a measure such as the use of riprap or the use of plant cover is needed to reduce streambank erosion.

This soil is well suited to trees, and many areas are wooded. The flooding is so brief that trees generally are not damaged. There are few limitations to planting or harvesting trees on this soil.

This soil is generally unsuitable for use as a site for buildings and sanitary facilities. Extensive recreation developments, such as golf fairways and hiking paths and trails, generally are not damaged by flooding. Special measures are needed in some areas to keep streams from forming new channels.

This soil is in capability subclass IIw and woodland suitability subclass 2s.

MaB—Markland silty clay loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on slack-water terraces. Most areas are irregularly shaped and range from 5 to 35 acres in size.

Typically, the surface layer is brown, friable silty clay loam about 10 inches thick. The subsoil is about 23 inches thick. The upper and middle parts of the subsoil are dark yellowish brown, firm silty clay; and the lower part is yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, firm silty clay and silty clay loam and has mottles in the upper part. In some areas the soil has slope of 0 to 2 percent, is wetter and has gray mottles in the upper part of the subsoil, or is eroded.

Included in mapping, and making up about 10 percent of most areas, are small areas of Pate soils. These soils are on slope breaks to uplands.

Permeability is slow, available water capacity is moderate, and runoff is medium. The organic matter content is moderately low or moderate. This soil is highly corrosive to untreated steel. The shrink-swell potential is high. The high water table is between depths of 36 and 72 inches in spring and other extended wet periods.

This soil is used for row crops. It is suited to corn, soybeans, and pasture plants. Erosion is a moderate hazard. This soil is cloddy if plowed when wet and sticky, and it crusts and puddles after hard rains. Minimum tillage, planting cover crops, and using grassed waterways help reduce runoff and soil loss. Incorporating crop residue or other organic matter into the surface layer helps improve tilth, increase the rate of water infiltration, and reduce crusting. Surface compaction, reduced growth, and increased runoff result from overgrazing or grazing when the soil is wet.

This soil is used as a site for buildings. It is moderately well suited to use as a site for buildings and to recreation uses, and it is poorly suited to use as septic tank absorption fields. Sanitary facilities should be connected to sewers and sewage treatment facilities, wherever possible. Backfilling along building foundations with a material that has low shrink-swell potential and reinforcing foundations will reduce damage from the shrinking and swelling of the soil. Foundation drains and protective coatings on exterior walls help prevent wet basements. The use of this soil as a site for local roads and streets is limited by the low strength and the shrink-swell potential of the soil. Those limitations can be overcome by using a suitable base material. The slow permeability and stickiness of the surface layer limit recreation uses. Most play areas and walkways need special surfacing.

This soil is in capability subclass IIIe and woodland suitability subclass 2c.

MaC2—Markland silty clay loam, 6 to 12 percent slopes, eroded. This deep, sloping, moderately well drained soil is on slack-water terraces. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is brown, firm silty clay loam about 6 inches thick. The subsoil is about 20 inches thick. The upper and middle parts of the subsoil are dark yellowish brown, firm silty clay; and the lower part is yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, firm silty clay and silty clay loam. In a few areas the slope is 12 to 18 percent.

Included in mapping, and making up about 10 percent of most areas, are a few small areas of severely eroded soils that have poor tilth and a few areas of Pate soils on slope breaks to uplands.

Permeability is slow, available water capacity is moderate, and runoff is rapid. The organic matter content is moderately low. The soil is highly corrosive to untreated steel and has a high shrink-swell potential. The high water table is between depths of 36 and 72 inches in spring and other extended wet periods.

This soil is moderately well suited to corn and soybeans. Erosion is a severe hazard in cultivated areas. Maintenance of good tilth is very difficult because of the subsoil material in the plow layer. This soil can be worked within a narrow range of moisture content. It crusts and puddles after hard rains and is very cloddy if plowed when wet and sticky. Incorporating crop residue or other organic matter into the surface layer improves tilth, increases the rate of water infiltration, and reduces crusting.

This soil is used mainly as permanent pasture, for which it is well suited. This use is very effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, reduces growth, and increases runoff. Reseeding by using companion crops or the trash-mulch or no-till seeding method helps reduce soil loss.

This soil is poorly suited to use as a site for buildings and as septic tank absorption fields, and it is moderately well suited to most recreation uses. Sanitary facilities

should be connected to sewers and sewage treatment facilities, wherever possible. Land shaping is needed in some areas. Backfilling along foundations with a material that has low shrink-swell potential and reinforcing foundations will reduce damage from the shrinking and swelling of the soil. Foundation drains and protective coatings on exterior walls help prevent wet basements. The use of this soil as a site for local roads and streets is limited by the low strength and the shrink-swell potential of the soil. Those limitations can be overcome by using a suitable base material. On sites disturbed by construction, a plant cover should be maintained to control erosion. Lawns are difficult to establish and maintain in the silty clay loam surface layer. Lawn seedings should be mulched. Because of the slow permeability and stickiness of the surface layer, most play areas and walkways need special surfacing.

This soil is in capability subclass IVe and woodland suitability subclass 2c.

MaD2—Markland silty clay loam, 12 to 18 percent slopes, eroded. This deep, moderately steep, moderately well drained soil is on dissected parts of slack-water terraces. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long and narrow and range from 5 to 25 acres in size.

Typically, the surface layer is brown, firm silty clay loam about 5 inches thick. The subsoil is about 20 inches thick. The upper and middle parts of the subsoil are dark yellowish brown, firm silty clay; and the lower part is yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, firm silty clay and silty clay loam. In a few areas the slope is 18 to 25 percent.

Included in mapping, and making up about 10 percent of most areas, are small areas of severely eroded soils that have poor tilth and are calcareous at the surface.

Permeability is slow, available water capacity is moderate, and runoff is very rapid. The organic matter content is moderately low, and the soil is highly corrosive to untreated steel. The shrink-swell potential is high. A seasonal high water table is between depths of 36 and 72 inches.

The soil is used as permanent pasture. It is poorly suited to corn and soybeans and moderately well suited to pasture plants. Erosion is a very severe hazard in cultivated areas. Maintenance of good tilth is very difficult because of the subsoil material in the plow layer. The soil can be worked within a narrow range of moisture content. It crusts and puddles after hard rains and is very cloddy if plowed when wet and sticky. Incorporating crop residue or other organic matter into the surface layer improves tilth, increases the rate of water infiltration, and reduces crusting. Grazing when the soil is wet causes compaction and excessive runoff and reduces yields. The trash-mulch or no-till method of pasture renovation reduces erosion during reseeding. Proper stocking and rotation of pastures help keep the pasture plants and the soil in good condition.

This soil is used as woodland and is well suited to this use. The species selected for planting should be tolerant of the high clay content of the subsoil. Logging roads and skid trails should be constructed on the contour, where possible, to reduce soil loss.

This soil is poorly suited to use as a site for buildings and recreation uses, and it generally is unsuited to use as septic tank absorption fields. Sanitary facilities should be connected to sewers and sewage treatment facilities wherever possible. Land shaping is needed in most areas. Some slopes, especially those in cut and filled areas, are unstable and subject to slippage. Backfilling along foundations with a material that has low shrink-swell potential and reinforcing foundations will reduce damage from the shrinking and swelling of the soil. Foundation drains and protective coatings on exterior walls help prevent wet basements. The use of this soil as a site for local roads and streets is limited by the low strength and the shrink-swell potential of the soil. Those limitations can be overcome by using a suitable base material. A plant cover should be maintained on construction sites. Lawns are difficult to establish and maintain in the silty clay loam surface layer. Lawn seedings should be mulched. Because of the slow permeability and stickiness of the surface layer, most play areas and walkways need special surfacing.

This soil is in capability subclass IVe and woodland suitability subclass 2c.

MaE2—Markland silty clay loam, 18 to 25 percent slopes, eroded. This deep, steep, moderately well drained soil is on dissected parts of slack-water terraces. Erosion has removed part of the original surface layer, and subsoil material has been mixed with the present surface layer. Most areas are long and narrow and range from 5 to 30 acres in size.

Typically, the surface layer is brown, firm silty clay loam about 4 inches thick. The subsoil is about 20 inches thick. The upper and middle parts of the subsoil are dark yellowish brown, firm silty clay; and the lower part is yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, firm silty clay and silty clay loam.

Included in mapping are small areas where the slope is 35 to 60 percent and small areas of severely eroded soils that are calcareous at the surface and have poor tilth. The inclusions make up about 10 percent of most areas.

Permeability is slow, available water capacity is moderate, and runoff is very rapid. The organic matter content is moderately low, and the soil is highly corrosive to untreated steel. The shrink-swell potential is high.

This soil is generally unsuited to cultivated crops and is poorly suited to pasture. The slope limits the use of

equipment. Overgrazing or grazing when this soil is wet causes surface compaction, excessive runoff, and poor tilth. Rotation of pastures and restricted grazing during wet periods help keep the pasture plants and the soil in good condition. Reseeding by using the trash-mulch or no-till seeding method reduces soil loss by erosion.

This soil is used mainly as woodland and is well suited to trees. Species selected for planting should be tolerant of the high clay content of the subsoil. Logging roads and skid trails should be established across the slope and protected from erosion with water bars.

This soil is generally unsuited to use as a site for buildings, septic tank absorption fields, and some recreation uses. Construction for recreation and urban uses is difficult, and the hazard of erosion is very severe if vegetation is removed. Trails in recreation areas should be protected against erosion. They should cross the slope, if possible. Steps should be used where paths and trails go up and down the slope. Most areas would be good, scenic recreation areas.

This soil is in capability subclass VIe and woodland suitability subclass 2c.

McA—Martinsville silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on stream terraces and outwash plains. Most areas are irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 35 inches thick. The upper and middle parts of the subsoil are yellowish brown, friable and firm silty clay loam; and the lower part is dark yellowish brown, firm sandy clay loam. The substratum to a depth of about 60 inches is yellowish brown, friable stratified loam, sandy clay loam, and sandy loam. In a few areas the soil has silty clay loam or silty clay lacustrine sediments in the substratum, a loam surface layer, or slope of 2 to 6 percent.

Included in mapping, and making up about 15 percent of most areas, are areas of Eldean soils that have sand and gravel in the substratum.

Permeability is moderate. The root zone is deep. The available water capacity is high, and runoff is slow. The organic matter content is moderately low or moderate.

This soil is used as cropland. It is well suited to crops grown year after year, such as corn and soybeans, and to specialty crops and pasture plants. It can be tilled and grazed early in spring and is well suited to irrigation. The surface layer crusts after hard rains. Maintaining high fertility and good soil structure are the main management concerns. Minimum tillage, planting cover crops, and incorporating crop residue or other organic matter into the surface layer help maintain tilth, increase the rate of water infiltration, and reduce crusting.

This soil is also used as a site for buildings. It is well suited to this use, to use as septic tank absorption fields, and to use as a site for recreation uses. Extending foundations to the substratum and backfilling along foundations with a material that has low shrink-swell potential will reduce damage from the shrinking and swelling of the soil. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by replacing the subsoil with a suitable base material. Sloughing is a hazard in excavations.

This soil is in capability class I and woodland suitability subclass 1o.

McB—Martinsville silt loam, 2 to 6 percent slopes. This deep, gently sloping, well drained soil is on broad stream terraces. Most areas are irregularly shaped and 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 34 inches thick. The upper part of the subsoil is yellowish brown, firm clay loam; and the lower part is dark yellowish brown, firm sandy clay loam. The substratum to a depth of about 60 inches is yellowish brown, friable stratified loam, sandy clay loam, and sandy loam. In a few areas the soil is eroded or has slope of 6 to 12 percent.

Included in mapping, and making up about 15 percent of most areas, are small areas of Eldean soils that have sand and gravel in the substratum.

Permeability is moderate. The root zone is deep. The available water capacity is high, and runoff is medium. The organic matter content is moderately low or moderate.

This soil is used as cropland. It is suited to corn, soybeans, wheat, hay, and pasture plants. It can be tilled and grazed early in spring. This soil is suited to irrigation if erosion is controlled. The surface layer crusts after hard rains. Reducing crusting and controlling erosion on long slopes are the main management concerns. Minimum tillage, planting cover crops, and incorporating crop residue or other organic matter into the surface layer help maintain tilth, increase the rate of water infiltration, and reduce crusting.

This soil is also used as a site for buildings. It is well suited to this use and to use as septic tank absorption fields. Extending foundations to the substratum and backfilling along foundations with a material that has low shrink-swell potential reduce damage from the shrinking and swelling of the soil. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by replacing the subsoil with a suitable base material. Sloughing is a hazard in excavations. A plant cover should be maintained on a site, if possible, during construction to reduce runoff and erosion.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

MnC2—Miamian silt loam, 8 to 15 percent slopes, eroded. This deep, strongly sloping, well drained soil is on dissected parts of Wisconsinan till plains. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are on ridge crests, knolls, and side slopes along drainageways. They are irregularly shaped and range from 5 to 35 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 21 inches thick. It is dark yellowish brown. The upper part of the subsoil is friable silty clay loam, and the middle and lower parts are firm clay loam. The substratum to a depth of about 60 inches is light olive brown, firm loam glacial till. In some areas the subsoil is more silty.

Included in mapping are Hennepin soils that have less clay in the subsoil. These soils are on shoulder slopes and side slopes. Small areas of soils that have a sandy loam surface layer are included in hummocky areas. The included soils make up about 15 percent of most areas.

Permeability is moderately slow in the Miamian soil, available water capacity is moderate, and surface runoff is rapid. The organic matter content is moderately low.

This soil is moderately well suited to corn, soybeans, and small grain. It is well suited to grasses and legumes for hay and pasture. Erosion is a severe hazard in areas that are cultivated, especially if they are plowed in fall. Measures to increase the rate of water infiltration, such as no-tillage or tillage that leaves the surface rough and partly covered with crop residue, reduce erosion. Grassed waterways help prevent gully erosion where runoff collects in a concentrated flow. Grazing when the soil is wet causes surface compaction and excessive runoff and reduces yields. The trash-mulch method of pasture renovation reduces the erosion hazard during reseeding. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees. Constructing logging roads and skid trails on the contour helps to control erosion. Plant competition can be controlled by spraying, mowing, or disking.

This soil is suitable for use as a site for buildings. Buildings should be designed to conform to the natural shape of the land. Land shaping is needed in some areas. Strengthening or replacing the base material of local roads and streets helps prevent damage caused by frost action. Runoff and erosion increase during construction; therefore, a plant cover should be maintained wherever possible.

This soil is moderately well suited to use as septic tank absorption fields. The moderately slow permeability and slope are limitations, but they can be overcome by enlarging the absorption field and by installing the distribution lines on the contour.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

MoD2—Miamian-Hennepin silt loams, 15 to 25 percent slopes, eroded. These deep, moderately steep, well drained soils are on dissected parts of glacial till plains of Wisconsinan age. Most areas of this complex are long and narrow and range from 10 to 50 acres in size. They contain about 50 percent Miamian silt loam and 30 percent Hennepin silt loam. The Miamian soil is on the ridge crests, shoulder slopes, and toe slopes; and the Hennepin soil is on the back slopes, where erosion has been more active. Areas of the Miamian and Hennepin soils are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

The Miamian soil typically has a surface layer of dark yellowish brown, friable silt loam about 5 inches thick. The subsoil is about 19 inches thick. The upper part of the subsoil is dark yellowish brown, friable silty clay loam; and the lower part is dark yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is light olive brown, firm clay loam glacial till. In some areas the soil has a silt mantle 22 to 40 inches thick. In some areas the soil is slightly wetter.

The Hennepin soil typically has a surface layer of very dark grayish brown, friable silt loam about 3 inches thick. The subsoil is yellowish brown, friable loam about 13 inches thick. The substratum to a depth of about 60 inches is dark yellowish brown, firm loam glacial till.

Included in mapping are narrow strips of soils that have slope of 25 to 35 percent. Also included are narrow areas of well drained Genesee and Lanier soils on flood plains. The included soils make up about 20 percent of most mapped areas.

Permeability is moderately slow in the Miamian soil and moderately slow or slow in the Hennepin soil. The available water capacity is moderate for both soils. Runoff is rapid on the Miamian soil and very rapid on the Hennepin soil. The organic matter content of both soils is moderately low.

These soils are used mainly as woodland and pasture. They are poorly suited to cultivated crops and moderately well suited to pasture. The slope severely limits the use of these soils as cropland. Grazing when the soils are wet causes surface compaction and excessive runoff and reduces yields. The trash-mulch or no-till seeding method reduces erosion during reseeding. Proper stocking, pasture rotation, and restricted grazing when the soils are wet help keep the pasture plants and the soils in good condition.

These soils are well suited to trees. Erosion is a moderate hazard, however, if the woodland management is not optimum. Logging roads and skid trails should be constructed on the contour where possible. Plant competition can be reduced by spraying, cutting, or girdling.

These soils are poorly suited to use as building sites and septic tank absorption fields and moderately well suited to some recreation uses. The slope limits these

uses. Land shaping and retaining walls are needed in most areas. Buildings should be designed to conform to the natural shape of the land. For local roads and streets, the slope limitation can be reduced by constructing on the contour. Constructing the leach lines in septic tank absorption fields across the slope will reduce the seepage of effluent to the soil surface. Cover should be maintained on a site, if possible, during construction to reduce erosion. Paths and trails should be constructed on the contour, where possible, and steps should be used where the paths go up and down the slope. Most areas are esthetically pleasing and are very beneficial as open space.

These soils are in capability subclass VIe and woodland suitability subclass 1r.

MoE2—Miamian-Hennepin silt loams, 25 to 35 percent slopes, eroded. These deep, steep, well drained soils are on dissected parts of glacial till plains of Wisconsinan age. Most areas of this complex are long and narrow and range from 10 to 60 acres in size. They are about 40 percent Miamian silt loam and 40 percent Hennepin silt loam. The Miamian soil is on the ridge crests and shoulder slopes and toe slopes, and the Hennepin soil is on back slopes, where erosion has been more active. Areas of the Miamian and Hennepin soils are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

The Miamian soil typically has a surface layer of dark yellowish brown, friable silt loam about 4 inches thick. The subsoil is about 19 inches thick. The upper part of the subsoil is dark yellowish brown, friable silty clay loam; and the lower part is dark yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is light olive brown, firm clay loam glacial till.

The Hennepin soil typically has a surface layer of very dark grayish brown, friable silt loam about 2 inches thick. The subsoil is yellowish brown, friable loam about 12 inches thick. The substratum to a depth of about 60 inches is dark yellowish brown, firm loam glacial till.

Included in mapping, and making up about 20 percent of most areas, are narrow strips of steeper soils and narrow areas of well drained Genesee and Lanier soils on flood plains.

Permeability is moderately slow in the Miamian soil and moderately slow or slow in the Hennepin soil. The available water capacity is moderate in both soils. Runoff is very rapid. The organic matter content is moderately low in both soils.

The soils in this complex are used mainly as woodland and pasture. They are unsuited to cultivated crops and are moderately well suited to pasture plants. Slopes are too steep for safe operation of modern farm machinery. Erosion is a severe hazard if adequate plant cover is not maintained. Grazing when the soils are wet causes surface compaction and excessive runoff and reduces yields. The trash-mulch seeding method reduces erosion during reseeding. Proper stocking, pasture rotation, and restricted grazing when the soils are wet help keep the pasture plants and the soils in good condition.

These soils are well suited to trees. The slope, however, severely limits the use of planting and harvesting equipment. Logging roads and skid trails should be constructed on the contour wherever possible. Plant competition can be reduced by spraying, cutting, or girdling.

These soils are poorly suited to building site development, sanitary facilities, and many recreation uses. Construction for recreation and urban uses is very difficult. Deep excavations are needed for these uses. Retaining walls are used in many areas. Erosion is a very severe hazard if vegetation is removed. Hiking paths and trails should be established across the slope, wherever possible, and permanent steps should be used where the paths go up and down the slope. Most areas are esthetically pleasing and are very beneficial as open space.

These soils are in capability subclass VIIe and woodland suitability subclass 1r.

MuC—Miamian-Urban land complex, 8 to 15 percent slopes. This complex consists of a deep, strongly sloping, well drained Miamian soil and Urban land. It is on dissected parts of Wisconsinan till plains. Areas of this complex range from 20 to 100 acres in size and are about 50 percent Miamian silt loam and 35 percent Urban land. The areas of Miamian soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Miamian soil has a surface layer of brown, friable silt loam about 6 inches thick. The subsoil is about 21 inches thick. It is dark yellowish brown. The upper part of the subsoil is friable silty clay loam, and the middle and lower parts are firm clay loam. The substratum to a depth of about 60 inches is light olive brown, firm clay loam glacial till. In some places, the soil has been radically altered. Some of the low areas have been filled or leveled during construction; and other small areas have been cut, built up, or smoothed. In some areas the subsoil is more silty, and in other areas the soil is slightly wetter.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping are small areas of Eden soils that are 20 to 40 inches deep to bedrock. Also included are areas where the slope is 15 to 25 percent. These inclusions make up about 15 percent of most areas.

The Miamian soil has moderately slow permeability and moderate available water capacity. Runoff on this soil is rapid. The organic matter content in the surface

layer is moderately low, and the soil is moderately corrosive to both steel and concrete.

The Miamian soil makes up the parks, open space, lawns, and gardens. It is well suited to lawns, vegetable and flower gardens, trees, and shrubs. Erosion is a hazard, however, because of the slope of the soil. Erosion is especially serious if the soil surface is disturbed and left bare. Disturbed areas are difficult to vegetate unless blanketed with topsoil. The subsoil material that is exposed has poor tilth. It is sticky when wet and hard when dry.

The Miamian soil is suited to building site development and is moderately well suited to recreation uses and sanitary facilities. The slope limits these uses. Land shaping, constructing local roads and streets on the contour, and the use of retaining walls are needed in most areas. The permeability and slope of the Miamian soil limit its use as septic tank absorption fields. Using an absorption field that is larger than normal or alternating absorption fields can help overcome these limitations. Distribution lines in septic tank absorption fields should be installed on the contour. Sanitary facilities commonly are connected to sewers and sewage treatment facilities. Storm sewers are used to handle the storm water runoff. Cover should be maintained on a site, if possible, during construction to reduce erosion. Homesites should be landscaped so that surface drainage is away from buildings. Onsite investigation is needed to determine the suitability of the soil for a specific use.

The Miamian soil is in capability subclass IIIe. It is not assigned to a woodland suitability subclass.

PbB2—Parke silt loam, 3 to 8 percent slopes, eroded. This deep, gently sloping, well drained soil is on ridgetop remnants on high, dissected terraces. These terraces are wide benches above the steep and very steep bedrock-controlled hillsides and slightly below the Kansan till plain. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil to a depth of about 145 inches is strong brown, friable silt loam and firm silty clay loam in the upper part; strong brown and yellowish red, firm clay loam and silty clay loam in the middle part; and strong brown, stratified, friable sandy clay loam and fine sandy loam in the lower part. In some areas the silty mantle is thicker or the slope is 0 to 2 percent.

Included in mapping, and making up about 15 percent of most areas, are a few areas of strongly sloping soils and a few small areas of the moderately well drained Ava soils.

Permeability is moderate. The root zone is deep. The available water capacity is high, and runoff is medium. The subsoil is medium acid to very strongly acid. This soil is highly corrosive to concrete. The potential for frost action is high.

This soil is used as pasture. It is well suited to corn, soybeans, wheat, hay, and pasture plants. The surface layer crusts after hard rains. Erosion is a hazard, especially on long slopes. Using contour cultivation and grassed waterways and returning crop residue to the soil can help reduce erosion. The use of this soil as pasture is very effective in controlling erosion. Grazing when the soil is wet, however, causes compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is also used for trees, for which it is well suited. Plant competition can be reduced by spraying, mowing, or disking.

This soil is well suited to use as a site for buildings, septic tank absorption fields, and most recreation uses. Backfilling along building foundations with a material that has low shrink-swell potential and reinforcing foundations will reduce damage from the shrinking and swelling of the soil. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by using suitable base material.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

PbC2—Parke silt loam, 8 to 15 percent slopes, eroded. This deep, strongly sloping, well drained soil is on ridgetop remnants on high, dissected terraces. These terraces are wide benches above the steep and very steep bedrock-controlled hillsides and slightly below the Kansan till plain. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long and irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil to a depth of about 60 inches is strong brown, friable silt loam and firm silty clay loam in the upper part and strong brown and yellowish red, firm clay loam in the lower part. In some areas the silty mantle is thicker or the slope is 3 to 8 percent or 15 to 25 percent.

Included in mapping, and making up about 15 percent of most mapped areas, are a few areas of moderately well drained Ava soils and moderately deep Eden soils. These included soils are on crests of slopes and on shoulder slopes.

Permeability is moderate. The root zone is deep, and the available water capacity is high. Runoff is rapid. The subsoil is very strongly acid to medium acid. This soil is highly corrosive to concrete. The potential for frost action is high.

This soil is used as pasture, and it is well suited to this use. It is moderately well suited to corn, soybeans, wheat, and hay. The surface layer crusts after hard rains. Erosion is a severe hazard in cultivated areas. Using contour cultivation and grassed waterways and returning crop residue to the soil help reduce erosion. The use of this soil as pasture is very effective in controlling erosion. Grazing when the soil is wet, however, causes surface compaction and excessive runoff and reduces yields. The trash-mulch method of pasture renovation reduces erosion during reseeding. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is also used as woodland. It is well suited to this use. Logging roads and skid trails should be on the contour, where possible, to reduce erosion. Plant competition can be reduced by spraying, mowing, or disking.

This soil is suited to use as a site for buildings and moderately well suited to use as septic tank absorption fields. Land shaping is needed in some areas. Buildings should be designed to conform to the natural shape of the land. Backfilling along foundations of buildings with a material that has low shrink-swell potential and reinforcing foundations will reduce damage from the shrinking and swelling of the soil. Installing the distribution lines in septic tank absorption fields on the contour will reduce seepage of the effluent to the soil surface. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by using suitable base material.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

PbD—Parke silt loam, 15 to 25 percent slopes. This deep, moderately steep, well drained soil is on side slopes of high, dissected terraces. These terraces are above the steep and very steep bedrock-controlled hillsides and slightly below the Kansan till plain. Most areas are long and irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil to a depth of about 60 inches is strong brown, friable silt loam and firm silty clay loam in the upper part and strong brown and yellowish red, firm clay loam in the lower part. In a few places the silty mantle is thinner or the slope is 25 to 35 percent.

Included in mapping are small areas of moderately deep Eden soils on the lower part of slopes and a few severely eroded soils on the upper part of slopes. These included soils make up about 15 percent of most areas.

Permeability is moderate. The root zone is deep, and the available water capacity is high. Runoff is rapid. The subsoil is very strongly acid to medium acid. This soil is highly corrosive to concrete. The potential for frost action is high.

In some places, this soil is used as pasture. It is moderately well suited to this use. It is poorly suited to use as cropland. Erosion is a severe hazard in cultivated areas. Using contour cultivation and grassed waterways and returning crop residue to the soil help reduce erosion. Grazing when the soil is wet causes compaction and excessive runoff and reduces yields. The trash-mulch method of pasture renovation reduces erosion during reseeding. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is used mainly as woodland and is well suited to trees. Logging roads and skid trails should be on the contour, where possible, to help control erosion.

Because of the slope, this soil is poorly suited to use as a site for buildings, septic tank absorption fields, and many intensive recreation uses. Land shaping is needed in most areas. Buildings should be designed to conform to the natural shape of the land. Backfilling along building foundations with a material that has lower shrink-swell potential and reinforcing foundations will reduce damage from the shrinking and swelling of the soil. Installing the distribution lines in septic tank absorption fields on the contour will reduce the seepage of effluent to the soil surface. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by using suitable base material. Erosion on paths and trails can be reduced by establishing these paths and trails on the contour and by using steps where they go up and down the slope. Cover should be maintained on a site, if possible, during construction to reduce erosion.

This soil is in capability subclass VIe and woodland suitability subclass 1r.

PbE—Parke silt loam, 25 to 35 percent slopes. This deep, steep, well drained soil is on side slopes of high, dissected terraces. These terraces are above the steep and very steep bedrock-controlled hillsides. Most areas are long and narrow and range from 20 to 200 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil to a depth of about 60 inches is strong brown, friable silt loam and silty clay loam in the upper part and strong brown and yellowish red, firm clay loam in the lower part. In a few areas the soil has slope of 35 to 60 percent.

Included in mapping, and making up about 20 percent of most areas, are small areas of moderately deep Eden soils on the lower part of slopes.

Permeability is moderate. The root zone is deep, and the available water capacity is high. Runoff is very rapid. The subsoil is very strongly acid to medium acid. This

soil is highly corrosive to concrete. The potential for frost action is high.

This soil is generally unsuited to use as cropland and moderately well suited to use as pasture. The slope limits the use of equipment. Erosion is a severe hazard. The trash-mulch method of pasture renovation reduces erosion during reseeding. Proper stocking and pasture rotation help keep the pasture plants and the soil in good condition.

This soil is used mainly as woodland. It is well suited to trees. The slope limits the use of planting and harvesting equipment. Logging roads and skid trails should be on the contour, if possible, and should be protected from erosion by water bars. Plant competition can be reduced by spraying or girdling.

Because of the slope, this soil is generally unsuitable for use as a site for buildings and septic tank absorption fields. Trails in recreation areas should be protected against erosion and should cross the slope, if possible. Most areas overlook scenic views.

This soil is in capability subclass VIe and woodland suitability subclass 1r.

PcB—Parke-Urban land complex, 3 to 8 percent slopes. This complex consists of a deep, gently sloping, well drained Parke soil and Urban land. It is on ridgetop remnants on high, dissected terraces. These terraces are on wide benches above the bedrock-controlled hillsides and slightly below the Kansan till plain. Areas of this complex range from 20 to 150 acres in size and contain about 55 percent Parke silt loam and 35 percent Urban land. The areas of Parke soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the surface layer of the Parke soil is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil to a depth of about 90 inches is strong brown, friable silt loam and firm silty clay loam in the upper part and strong brown and yellowish red, firm clay loam in the lower part. In some places, the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed. In some areas the loess mantle is thicker or the slope is 0 to 3 percent or 8 to 15 percent.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of most areas, are a few areas of moderately well drained Ava soils.

Permeability is moderate in the Parke soil. This soil has a deep root zone and high available water capacity. Runoff is medium. The subsoil is very strongly acid to medium acid. The Parke soil is highly corrosive to concrete. The potential for frost action is high.

The Parke soil makes up the parks, open space, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Perennials selected for planting should be tolerant of acid soil. Erosion is a hazard if the soil is disturbed and left bare. The included spots of cut and filled land have poor tilth.

The Parke soil is well suited to use as a site for buildings and septic tank absorption fields. Most sanitary facilities are connected to sewers and sewage treatment facilities. Gutters and storm sewers are used in most areas. Backfilling along building foundations with a material that has low shrink-swell potential and reinforcing foundations will reduce damage from the shrinking and swelling of the soil. The use of this soil as a site for local roads and the streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by using suitable base material.

The Parke soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

PcC—Parke-Urban land complex, 8 to 15 percent slopes. This complex consists of a deep, strongly sloping, well drained Parke soil and Urban land. It is on ridgetop remnants on high, dissected terraces. These terraces are wide benches above the steep and very steep bedrock-controlled hillsides and slightly below the Kansan till plain. Areas of this complex range from 20 to 120 acres in size and contain about 60 percent Parke silt loam and 30 percent Urban land. The areas of Parke soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the surface layer of the Parke soil is brown, friable silt loam about 7 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil to a depth of about 60 inches is strong brown, friable silt loam and firm silty clay loam in the upper part and strong brown and yellowish red, firm clay loam in the lower part. In some areas the loess mantle is thicker. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed. In a few areas the slope is 3 to 8 percent or 15 to 25 percent.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of most areas, are small areas of moderately well drained Ava soils and moderately deep Eden soils.

Permeability is moderate in the Parke soil. The root zone is deep, and the available water capacity is high. Runoff is rapid. The subsoil is medium acid to very

strongly acid. The Parke soil is highly corrosive to concrete. The potential for frost action is high.

The Parke soil makes up the parks, open space, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Perennials selected for planting should be tolerant of acid soil. Erosion is a severe hazard if the soil is disturbed and left bare. The included spots of cut and filled areas have poor tilth.

The Parke soil is suited to use as a site for buildings and moderately well suited to use as septic tank absorption fields. Most sanitary facilities are connected to sewers and sewage treatment facilities. Gutters and storm sewers are used in most areas. Land shaping has been done in some areas, and most buildings are designed to conform to the natural shape of the land. Backfilling along foundations of buildings with a material that has low shrink-swell potential and reinforcing foundations will reduce damage from shrinking and swelling of the soil. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by using suitable base material. A plant cover should be maintained on a site, if possible, during construction to reduce erosion.

The Parke soil is in capability subclass IIIe. It is not assigned to a woodland suitability subclass.

PfC—Pate silty clay loam, 8 to 15 percent slopes. This deep, strongly sloping, moderately well drained soil is on the lower one-third of hillsides. Most areas are long and narrow and range from 10 to 60 acres in size.

Typically, the surface layer is brown, friable silty clay loam about 11 inches thick. The subsoil is about 44 inches thick. The upper part of the subsoil is brown, yellowish brown, and dark yellowish brown, mottled, firm silty clay loam and silty clay; and the lower part is brown and light olive brown, firm flaggy silty clay. Rippable interbedded light olive brown limestone and gray shale bedrock is at a depth of about 55 inches. In a few areas, slope is 15 to 25 percent or 3 to 8 percent. In a few areas, bedrock is at a depth of 20 to 40 inches.

Permeability is very slow, available water capacity is low or moderate, and runoff is rapid. The organic matter content is moderate. The subsoil is highly corrosive to untreated steel. The shrink-swell potential is high.

This soil is used as pasture and is moderately well suited to this use. Some of the less sloping areas had been cultivated and are now in brushy pasture commonly consisting of bluegrass, thorn apple, and redcedar. Controlling erosion and maintaining a maximum stand of forage species are major management concerns. If the pasture is overgrazed, erosion is a severe hazard. Using cover crops or companion crops or using the trash-mulch or no-till seeding methods helps reduce erosion during reseeding. Proper stocking, pasture rotation, and timely application of fertilizer help maintain a good stand of forage species.

This soil is used as woodland and is well suited to trees. Logging roads and skid trails should be constructed on the contour, where practical, to help control erosion. Mechanical tree planting and weed control can be accomplished on this soil. Species selected for planting should be tolerant of the high clay content of the subsoil.

This soil is poorly suited to use as a site for buildings and is generally unsuited to use as septic tank absorption fields. Slope, high shrink-swell potential, and very slow permeability are limitations to these uses. The interbedded shale and limestone bedrock in the substratum is rippable with heavy equipment and rarely requires blasting. Ground water seepage over the nearly impervious shale can result in wet basements and seeps in excavations. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. Backfilling along basement walls with a material that has low shrink-swell potential and reinforcing basement walls and foundations help reduce damage from the shrinking and swelling of the soil. If this soil is used as a site for local roads and streets, strengthening or replacing the base material helps prevent damage resulting from the low strength and high shrink-swell potential of the soil. Cuts made into this soil expose clayey material that is sticky when wet and hard when dry. The clayey material is difficult to grade or handle. Deep cuts are subject to slippage.

This soil is in capability subclass IIIe and woodland suitability subclass 1c.

PfD—Pate silty clay loam, 15 to 25 percent slopes. This deep, moderately steep, moderately well drained soil is on colluvial positions on the lower one-third of hillsides. Hillside slips are common. Most areas are long and narrow and range from 20 to 100 acres in size.

Typically, the surface layer is brown, friable silty clay loam about 10 inches thick. The subsoil is about 44 inches thick. The upper part of the subsoil is brown, yellowish brown, and dark yellowish brown, firm silty clay loam and silty clay; and the lower part is brown and light olive brown, firm flaggy silty clay. The subsoil is mottled in the upper 14 inches. Rippable interbedded light olive brown limestone and gray shale bedrock is at a depth of about 54 inches. In a few areas the soil has slope of 25 to 35 percent or is 20 to 40 inches deep to bedrock.

Included in mapping are gently sloping narrow benches that are roughly on the contour. Also included are a few bedrock outcroppings. The inclusions make up about 15 percent of most areas.

Permeability is very slow, the available water capacity is low or moderate, and runoff is very rapid. The organic matter content is moderate. The subsoil is highly corrosive to untreated steel. The shrink-swell potential is high.

This soil is used as pasture and is moderately well suited to this use. Some of the less sloping areas had

been farmed and now are in brushy pasture commonly consisting of bluegrass, thorn apple, and redcedar. If the pasture is overgrazed, erosion is a severe hazard. Using cover crops or companion crops or using the trash-mulch or no-till seeding methods helps reduce erosion. Proper stocking, pasture rotation, and timely application of fertilizer help maintain a good stand of forage species.

This soil is used as woodland and is well suited to trees. Logging roads and skid trails should be constructed on the contour, where practical, to help control erosion. Mechanical tree planting and weed control can be accomplished; however, safety precautions are particularly necessary because of the steepness of slope. Species selected for planting should be tolerant of the high clay content of the subsoil to reduce seedling mortality and obtain better growth.

This soil is generally unsuitable for use as a site for buildings and for use as septic tank absorption fields. It is subject to slippage. Ground water seeps over the bedrock and onto slopes and into excavations. Diverting surface water and ground water away from the soil is a good deterrent to slippage. Cut and filled areas are especially subject to slippage. Cuts expose clayey material that is sticky when wet, hard when dry, and very difficult to grade. The interbedded shale and limestone bedrock in the substratum is rippable by heavy equipment and rarely requires blasting.

This soil is in capability subclass IVe and woodland suitability subclass 1c.

PfE—Pate silty clay loam, 25 to 35 percent slopes. This deep, steep, moderately well drained soil is on colluvial positions on the lower one-third of hillsides. Hillside slips are common. Most areas are long and narrow and range from 15 to 150 acres in size.

Typically, the surface layer is brown, friable silty clay loam about 5 inches thick. The subsoil is olive brown, firm clay about 46 inches thick. It is mottled in the upper part. Rippable interbedded light olive brown limestone and gray shale bedrock is at a depth of about 51 inches. In a few areas the soil has slope of 15 to 25 percent.

Included in mapping are narrow, gently sloping benches. Also included are bedrock outcroppings. These inclusions make up about 15 percent of most areas.

Permeability is very slow, available water capacity is low or moderate, and runoff is very rapid. The organic matter content is moderate. This soil is highly corrosive to untreated steel. The shrink-swell potential is high.

This soil is used as pasture but is poorly suited to this use. If the pasture is overgrazed, erosion is a severe hazard. Using cover crops or companion crops or using the trash-mulch or no-till seeding methods helps reduce erosion. Proper stocking, pasture rotation, and timely application of fertilizer help maintain a good stand of forage species.

This soil is used as woodland and is well suited to trees. Logging roads and skid trails should be constructed on the contour, where practical, to help control erosion. The steepness of slope limits the use of planting equipment. Species selected for planting should be tolerant of the high clay content of the subsoil.

This soil is generally unsuitable for use as a site for buildings and for use as septic tank absorption fields. It is subject to slippage. Ground water seeps over the bedrock and onto slopes. Diverting surface and ground water away from the soil is a good deterrent to slippage. Cut and filled areas are especially subject to slippage. The interbedded shale and limestone bedrock in the substratum is rippable with heavy equipment and rarely requires blasting. Cuts expose clayey material that is sticky when wet, hard when dry, and very difficult to grade.

This soil is in capability subclass VIIe and woodland suitability subclass 1c.

PhD—Pate-Urban land complex, 15 to 25 percent slopes. This complex consists of a deep, moderately well drained, moderately steep Pate soil and Urban land. It is on colluvial positions on the lower part of hillsides. Areas of this complex range from 30 to 100 acres in size and contain about 60 percent Pate silty clay loam and 30 percent Urban land. The areas of Pate soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Pate soil has a surface layer of brown, friable silty clay loam about 10 inches thick. The subsoil is about 44 inches thick. The upper part of the subsoil is brown, yellowish brown, and dark yellowish brown, mottled, firm silty clay loam and silty clay; and the lower part is yellowish brown and light olive brown, firm flaggy silty clay. Rippable interbedded light olive brown limestone and gray shale bedrock is at a depth of about 54 inches. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed. In a few areas the soil has slope of 8 to 15 percent or is 20 to 40 inches deep to bedrock.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of most areas, are small areas of well drained Elkinsville soils. These soils are on foot slopes.

Most areas of this complex are artificially drained by sewer systems, gutters, and to a lesser extent, foundation drains.

Permeability is very slow in the Pate soil. The available water capacity is low or moderate, and runoff is very rapid. The organic matter content is moderate, and the shrink-swell potential is high. The soil is highly corrosive to untreated steel.

The Pate soil makes up the parks, open space, lawns, and gardens. It is well suited to trees and shrubs but is poorly suited to vegetables and flowers. Erosion is a severe hazard if the soil is disturbed or cultivated. The included areas that have been cut and filled are generally unsuitable for lawns and gardens. Subsoil material that is exposed in these areas has very poor tilth. It is sticky when wet and hard when dry.

The Pate soil is generally unsuited to use as a site for buildings and to use as septic tank absorption fields. It is subject to slippage. Diverting surface and ground water away from the soil is a good deterrent to slippage. Cut and filled areas are especially subject to slippage. Cuts expose clayey material that is sticky when wet, hard when dry, and very difficult to grade. Most sanitary facilities are connected to sewers and sewage treatment facilities. Onsite investigation is needed to properly evaluate a site for a specific use.

The Pate soil is in capability subclass VIe. It is not assigned to a woodland suitability subclass.

Pn—Patton silty clay loam. This deep, nearly level, poorly drained soil is in lacustrine basins. It receives runoff from adjacent higher soils and is subject to ponding. Most areas are irregularly shaped and 5 to 100 acres in size. Slope is 0 to 2 percent.

Typically, the surface layer is very dark gray, friable silty clay loam about 7 inches thick. The subsurface layer is very dark gray, mottled, friable silty clay loam about 13 inches thick. The subsoil is dark gray and dark grayish brown, mottled, firm silty clay loam about 17 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled, stratified, friable silty clay loam and silt loam. In some places the soil is underlain by waterworked glacial till and has more sand in the lower part of the subsoil. In some other places the soil has loamy material in the upper part of the subsoil.

Included in mapping, and making up about 15 percent of most areas, are small areas of Henshaw and Markland soils on rises and Wakeland and Genesee soils on flood plains.

The high water table is near or above the surface in spring and other extended wet periods. The root zone is deep. Permeability is moderate or moderately slow, the available water capacity is high or very high, and runoff is very slow or ponded. The organic matter content is high. The subsoil is highly corrosive to untreated steel. The potential for frost action is high.

This soil is used as cropland. It is well suited to corn and soybeans. The poor natural drainage is the main limitation to farming. Surface drains commonly are used to remove excess surface water, and subsurface drains are used to lower the seasonal high water table. It is important to restrict tillage to a limited range in moisture content because this soil becomes compacted and cloddy if worked when wet and sticky. Tillage and harvesting operations are best performed at optimum moisture levels and with equipment that minimizes soil compaction. Incorporating crop residue or other organic matter into the surface layer increases the rate of water infiltration and improves tilth.

In a few undrained areas this soil is used as woodland. It is well suited to trees. Species selected for planting should be tolerant of wet soil. Logging can be done during the drier parts of the year. Plant competition can be reduced by spraying, mowing, or disking.

This soil is used as a site for buildings. It is poorly suited to use as a site for buildings and recreation uses and generally is unsuited to use as septic tank absorption fields. The poor natural drainage is the main limitation to these uses. This soil is better suited to buildings without basements than to buildings with basements. Drainage ditches and subsurface drains are used to remove excess surface water and lower the seasonal high water table. Building sites should be landscaped for good surface drainage. The use of this soil as a site for roads is limited by the low strength of the soil, the hazard of ponding, and the hazard of frost action. These limitations can be overcome by raising the site with well compacted suitable base material and by providing drainage with side ditches and culverts. Sanitary facilities should be connected to sewers and sewage treatment facilities.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

Po—Pits, gravel. This miscellaneous area consists of open excavations from which gravel and sand have been taken for use in construction. Most pits are on terraces and flood plains and in other areas underlain by glacial outwash. Eldean, Fox, Genesee, Martinsville, Princeton, and Ross soils are in these areas. Gravel pits range from 3 to 50 acres in size. Some pits are actively mined and are being enlarged.

The material in gravel pits consists of layers of gravel and sand that are variable in thickness and in orientation. The kind of aggregate and the size of grains are fairly uniform within a layer, but they are likely to differ considerably from the material in an adjacent layer. Some layers contain an appreciable amount of silt and sand. Nearly all of the large aggregates are rounded. Quartz, granite, and other siliceous materials are common, but limestone pebbles are dominant. In some places a weakly bonded conglomerate has formed through cementation by calcareous material. Limestone and shale in these areas are generally of local origin. Selective mining is practiced so that the desirable kinds of aggregate can be obtained.

Many gravel pit areas contain large piles of sands or other sorted materials. Because of the nature of the operations, material in spoil banks varies over a short distance. As a rule, the stripped material is low in content of organic matter and available water capacity, and it is poorly suited to the growth of plants.

As a result of instability of the soil material, most areas are subject to erosion and are a potential source of sediment. Areas that are no longer being mined should be reclaimed so that plants can be established to help reduce erosion. Grasses and trees that can tolerate the low available moisture capacity and unfavorable properties of the material should be selected for seeding and planting.

Some gravel pits contain water that is potentially suitable for wildlife habitat and recreation.

This miscellaneous area is not assigned to a capability subclass or to a woodland suitability subclass.

PrA—Princeton sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on broad terraces. Most areas are long, wide bands and range from 10 to 200 acres in size.

Typically, the surface layer is brown, friable sandy loam about 10 inches thick. The subsoil is about 47 inches thick. The upper part of the subsoil is dark yellowish brown and brown, friable loam, sandy clay loam, and sandy loam; and the lower part is reddish brown and brown, friable sandy loam. The substratum to a depth of about 75 inches is brown, stratified, loose loamy sand and fine sand. In a few areas the soil has more silt and clay in the surface layer and upper part of the subsoil.

Permeability is moderate. The root zone is deep. The subsoil is neutral to strongly acid. Tilth is good throughout a wide range in moisture content. The available water capacity is moderate. Runoff is slow.

This soil is used as cropland. In some irrigated areas it is used for vegetables, melons, and strawberries (fig. 5). This soil is well suited to corn, soybeans, wheat, pasture plants, and specialty crops. It is well suited to irrigation and minimum tillage. Maintaining the organic matter content of the soil and reducing soil blowing are the main management concerns. Including meadow crops in the cropping system helps maintain the organic matter content and reduce soil blowing. Planting windbreaks also reduces soil blowing. This soil is well suited to grazing early in spring.

This soil is well suited to trees, but because of its suitability for cropland use, it is used as woodland in very

Figure 5.—Princeton sandy loam, 0 to 2 percent slopes, is well suited to melons.

few areas. Spraying, mowing, or disking helps reduce plant competition.

This soil is well suited to use as a site for buildings, septic tank absorption fields, and recreation uses. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil. That limitation can be overcome by using a suitable base material. Cutbanks in excavations may cave unless shored up.

This soil is in capability class I and woodland suitability subclass 1o.

PrB—Princeton sandy loam, 2 to 6 percent slopes. This deep, gently sloping, well drained soil is on slight rises and on slopes along shallow waterways on broad terraces. Most areas are long and narrow, oval, or irregularly shaped and range from 3 to 40 acres in size.

Typically, the surface layer is brown, friable sandy loam about 8 inches thick. The subsoil is about 45 inches thick. The upper part of the subsoil is dark yellowish brown, friable loam; and the middle and lower parts are brown and reddish brown, friable and firm sandy clay loam and sandy loam. The substratum to a depth of about 75 inches is brown, stratified, loose loamy sand and fine sand. In a few areas the soil has more silt and clay in the surface layer and in the upper part of the subsoil.

Permeability is moderate. The root zone is deep. The subsoil is neutral to strongly acid. Tilth is good throughout a wide range in moisture content. The available water capacity is moderate. Runoff is slow.

This soil is mainly used as cropland. In some irrigated areas it is used for vegetables and strawberries. This soil is well suited to corn, soybeans, wheat, pasture plants, and specialty crops. It is suited to irrigation and minimum tillage. Maintaining the organic matter content of the soil and reducing soil blowing and erosion are the main management concerns. Including meadow crops in the cropping system, planting winter cover crops, and using grassed waterways help maintain the organic matter content and reduce soil blowing and water erosion. Planting windbreaks also reduces soil blowing. This soil is well suited to grazing early in spring.

This soil is well suited to trees, but because of its suitability for cropland use, it is used as woodland in only a few areas. Spraying, mowing, or disking helps reduce plant competition.

The soil is well suited to use as a site for buildings, septic tank absorption fields, and recreation uses. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil. That limitation can be overcome by using a suitable base material. Cutbanks in excavations may cave unless shored up.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

PrC2—Princeton sandy loam, 6 to 12 percent slopes, eroded. This deep, sloping, well drained soil is on the sides of waterways on broad terraces. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long and narrow and range from 5 to 25 acres in size.

Typically, the surface layer is dark yellowish brown, friable sandy loam about 5 inches thick. The subsoil is about 42 inches thick. The upper part of the subsoil is dark yellowish brown, friable loam; and the middle and lower parts are brown and reddish brown, friable and firm sandy clay loam and sandy loam. The substratum to a depth of about 70 inches is brown stratified, loose loamy sand and fine sand. In a few areas more silt and clay are in the surface layer and the upper part of the subsoil.

Permeability is moderate. The root zone is deep. The subsoil is neutral to strongly acid. Tilth is good throughout a wide range in moisture content. The available water capacity is moderate. Runoff is medium.

This soil is used as cropland. In some irrigated areas it is used for vegetables and strawberries. It is moderately well suited to corn, soybeans, and wheat. Water erosion and soil blowing are hazards in cultivated areas. Including grasses and legumes in the cropping system helps control erosion in cultivated areas. Minimum tillage, planting cover crops, and using grassed waterways increase the rate of water intake and reduce soil loss.

This soil is well suited to pasture, but it is used for permanent pasture in only a few areas. It is well suited to grazing early in spring. Proper stocking and pasture rotation help keep the pasture plants and the soil in good condition.

This soil is also suited to trees, but only in a few areas is it used as woodland. It is well suited to use as habitat for openland and woodland wildlife. Spraying, mowing, or disking helps reduce plant competition.

This soil is suited to use as a site for buildings and moderately well suited to use as septic tank absorption fields and to recreation uses. Land shaping is needed in some areas. Buildings should be designed to conform to the natural shape of the land. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil. That limitation can be overcome by using a suitable base material. Installing the distribution lines in septic tank absorption fields on the contour reduces seepage of effluent to the soil surface. Cutbanks in shallow excavations may cave unless shored up. A plant cover should be maintained on a site, if possible, during construction to reduce erosion.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

RdA—Raub silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on Wisconsinan till plains. It is adjacent to depressions and

shallow drainageways. Most areas are oblong or fan shaped and range from 3 to 20 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 5 inches thick. The subsoil is brown, dark yellowish brown, and yellowish brown, mottled, firm silty clay loam and clay loam about 38 inches thick. The substratum to a depth of about 60 inches is yellowish brown, mottled, friable clay loam. In some places the soil is wetter and has a thicker mantle of loess.

Included in mapping, and making up about 15 percent of most areas, are a few small areas of moderately well drained Dana soils. These soils are slightly higher on the landscape and are more sloping.

The seasonal high water table is between depths of 12 and 36 inches in winter and in spring and other extended wet periods. This soil has moderately slow permeability and high available water capacity. Runoff is slow. The soil has high organic matter content and good tilth. The subsoil is dominantly strongly acid to slightly acid; in some places it is neutral in the lower part.

This soil is mainly used as cropland. It is well suited to corn, soybeans, wheat, and hay and to pasture plants. It can be used for row crops year after year under optimum management. Drainage is the main management concern. This soil dries slowly in spring, and in areas not artificially drained, planting is delayed in most years. Surface and subsurface drains are used. Soil compaction is a problem if heavy machinery is used.

This soil is poorly suited to use as a site for buildings and to use as septic tank absorption fields, and it is moderately well suited to many recreation uses. Wetness and moderately slow permeability limit these uses. Curtain drains can lower the seasonal high water table in septic tank absorption fields. Alternating septic tank absorption fields can also help overcome the wetness and permeability limitations. Building sites should be landscaped so that surface water drains away from foundations. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by providing artificial drainage and by using a suitable base material.

This soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

Rn—Ross loam, rarely flooded. This deep, nearly level, well drained soil is on flood plains and low terraces. Areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 9 inches thick. The subsurface layer is dark brown, friable loam about 7 inches thick. The subsoil is dark brown and brown, friable loam about 21 inches thick. The substratum to a depth of about 60 inches is dark yellowish brown, friable loam. In some places the soil contains more sand throughout.

Included in mapping, and making up about 15 percent of most areas, are small areas of the more sandy Lanier and Stonelick soils. These soils are in low areas and along stream channels.

This soil has moderate permeability and high available water capacity. Runoff is slow. The organic matter content is high. This soil has a seasonal high water table between depths of 48 and 72 inches in winter and in spring and other extended wet periods.

This soil is used mainly as cropland, and it is well suited to corn, soybeans, wheat, hay, and specialty crops. It is well suited to irrigation. Crops usually can be grown without flood damage. Some areas used for specialty crops, such as sweet corn, are irrigated. Such practices as conservation tillage, which retains crop residue on the surface throughout the year, and returning crop residue to the soil conserve moisture and maintain tilth.

This soil is well suited to pasture. Flooding commonly occurs during the nongrazing season. Grazing when the soil is wet causes compaction and reduces yields. Proper stocking, pasture rotation, and restricted grazing during extended dry periods help keep the pasture plants and the soil in good condition.

This soil is well suited to trees, but because of its suitability for cropland use, it is used as woodland in only a few areas. It is also well suited to habitat for openland and woodland wildlife.

This soil is generally unsuited to use as a site for buildings and sanitary facilities because of the hazard of flooding. For some sanitary facilities, the hazard of ground water pollution is an additional limitation. The use of this soil as a site for local roads and streets is limited by the low strength of the soil, the hazard of flooding, and the hazard of frost action. Those limitations can be overcome by providing suitable base material and by elevating the road base. This soil is a good source of topsoil.

This soil is in capability class I and woodland suitability subclass 1o.

RpA—Rossmoyne silt loam, 0 to 3 percent slopes. This deep, nearly level, moderately well drained soil is on Illinoian till plains. Most areas are irregularly shaped and range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 64 inches thick. The upper part of the subsoil is yellowish brown, mottled, friable and firm silty clay loam; the middle part is a fragipan consisting of yellowish brown, mottled, very firm clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 92 inches is yellowish brown, mottled, firm clay loam glacial till. In

some areas the soil has a more weakly developed fragipan.

Included in mapping, and making up about 15 percent of most mapped areas, are small areas of somewhat poorly drained Avonburg soils. These soils are in depressions and swales.

Permeability is moderate above the fragipan and slow in the fragipan. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is moderate. Runoff is slow. A perched high water table is between depths of 18 and 36 inches in winter and in spring and other extended wet periods. The potential for frost action in the soil is high. The soil is highly corrosive to untreated steel and concrete.

The soil is used as cropland, pasture, and woodland. It is well suited to cropland use and can be used for row crops year after year under good management. In some years planting is delayed in spring because of the wetness of the soil. Subsurface drains are used to improve drainage. The soil is subject to crusting after hard rains. Returning crop residue to the soil or adding other organic matter helps to improve fertility, reduce crusting, and increase the rate of water infiltration.

This soil is well suited to pasture, but it is poorly suited to grazing early in spring, when it is wet. Grazing when the soil is wet causes compaction and poor tilth. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture in good condition.

The soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed by spraying, mowing, disking, cutting, or girdling. Species selected for planting should be tolerant of a restricted root zone.

This soil is moderately well suited to use as a site for buildings and poorly suited to use as septic tank absorption fields. Wetness is the main limitation to these uses. Subsurface drains and storm sewers can be used to improve drainage. This soil is better suited to houses without basements than to houses with basements. Building sites should be landscaped so surface water drains away from foundations and septic tank absorption fields. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. This soil can be used for septic tank absorption fields if an absorption area that is larger than normal is used or if alternating absorption fields are used. Absorption fields should be located on the higher parts of the landscape. The use of this soil for local roads and streets is limited by the hazard of frost action in the soil and the low strength of the soil. These limitations can be overcome by providing artificial drainage and by providing suitable base material. Play areas and walkways need special surfacing because the soil is sticky when wet.

This soil is in capability subclass IIw and woodland suitability subclass 2d.

RpB2—Rossmoyne silt loam, 3 to 8 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is on Illinoian till plains. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 64 inches thick. The upper part of the subsoil is yellowish brown, mottled, friable and firm silty clay loam; the middle part is a fragipan consisting of yellowish brown, mottled, firm and very firm clay loam; and the lower part is yellowish brown, firm clay loam. The substratum to a depth of about 92 inches is light olive brown, mottled firm clay loam glacial till. In some areas the soil has a more weakly developed fragipan.

Included in mapping are small areas of uneroded soils that are on the crest of ridgetops and a few areas of severely eroded soils that are along shallow waterways and have poor tilth. Also included are small areas of somewhat poorly drained Avonburg soils that are in flatter areas. The included soils make up about 15 percent of most areas.

This soil has moderate permeability above the fragipan and slow permeability in the fragipan. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is low. Runoff is medium. A perched high water table is between depths of 18 and 36 inches in winter and in spring and other extended wet periods. The potential for frost action is high. This soil is highly corrosive to untreated steel and concrete.

This soil is used as cropland and is well suited to corn, soybeans, wheat, oats, and hay. Maintenance of the organic matter content of the soil and control of erosion are the main management concerns. The surface layer crusts after hard rains. Using minimum tillage or contour tillage and planting cover crops help prevent soil loss. Returning crop residue to the soil and adding other organic matter help to improve tilth, reduce crusting, and increase the water infiltration rate. This soil's natural drainage generally is adequate for farming, but random subsurface drains are needed in the included areas of wetter soils.

This soil is used as pasture and is well suited to this use. Grazing when this soil is wet, however, causes compaction and poor tilth. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help to keep the pasture plants and the soil in good condition.

This soil is used as woodland and is well suited to trees. Plant competition can be reduced by spraying, mowing, disking, cutting, or girdling. Species selected for planting should be tolerant of a restricted root zone.

This soil is moderately well suited to use as a site for buildings and intensive recreation uses. It is poorly suited

to use as septic tank absorption fields. This soil is better suited to houses without basements than to houses with basements. Building sites should be landscaped so that surface water drains away from foundations and septic tank absorption fields. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. The use of this soil as septic tank absorption fields is limited by the slow permeability and the seasonal wetness. Those limitations can be partly overcome by increasing the size of the absorption area or by using alternating absorption fields. Absorption fields should be located on the higher parts of the landscape. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by providing suitable base material and artificial drainage. Play areas and walkways may require special surfacing because the soil is sticky when wet.

This soil is in capability subclass IIe and woodland suitability subclass 2d.

RpC2—Rossmoyne silt loam, 8 to 15 percent slopes, eroded. This deep, strongly sloping, moderately well drained soil is on Illinoian till plains. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 6 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 62 inches thick. The upper part of the subsoil is yellowish brown, mottled, friable and firm silty clay loam; the middle part is a fragipan of yellowish brown, very firm and brittle clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 92 inches is yellowish brown, mottled, firm clay loam glacial till. In some areas the soil has a more weakly developed fragipan or slope of slightly more than 15 percent.

Included in mapping, and making up about 15 percent of most areas, are small areas of severely eroded soils along waterways and areas of well drained Cincinnati, Bonnell, and Switzerland soils on the upper part of slopes.

This soil has moderate permeability above the fragipan and slow permeability in the fragipan. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is low. Runoff is rapid. A perched high water table is between depths of 18 and 36 inches in winter and in spring and other extended wet periods. The potential for frost action is high. This soil is highly corrosive to uncoated steel and concrete.

This soil is used as pasture, and in a few areas it is also used as cropland. It is moderately well suited to corn, soybeans, wheat, and oats and well suited to pasture plants. Erosion is a severe hazard in cultivated areas. The surface layer crusts after hard rains. Using minimum tillage and grassed waterways, planting cover crops, and regularly adding organic matter reduce crusting and soil loss. Overgrazing or grazing when the soil is wet causes compaction, increases runoff, and reduces yields. Pasture rotation and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is used as woodland and is suited to trees. Plant competition can be reduced by spraying, mowing, or disking. Logging roads and skid trails should be laid out across the slope where possible. Species selected for planting should be tolerant of a restricted root zone.

This soil is moderately well suited to use as a site for buildings and poorly suited to use as septic tank absorption fields. Land shaping is needed in some areas. Building sites should be landscaped so that surface water drains away from the foundations and septic tank absorption fields. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. The use of the soil as septic tank absorption fields is limited by the seasonal wetness and the slow permeability. Those limitations can be partly offset by using curtain drains and absorption areas that are larger than normal. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by providing suitable base material and artificial drainage.

This soil is in capability subclass IIIe and woodland suitability subclass 2d.

RtA—Rossmoyne-Urban land complex, 0 to 3 percent slopes. This complex consists of a deep, nearly level, moderately well drained Rossmoyne soil and Urban land. It is on smooth Illinoian till plains. Areas of this complex range from 10 to 1,000 acres in size and are about 60 percent Rossmoyne silt loam and 30 percent Urban land. The areas of Rossmoyne soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Rossmoyne soil has a surface layer of dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 64 inches thick. The upper part of the subsoil is yellowish brown, mottled, friable and firm silty clay loam; the middle part is a fragipan consisting of yellowish brown, mottled, very firm clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 92 inches is yellowish brown, mottled firm clay loam glacial till. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of most mapped areas, are small areas of somewhat poorly drained Avonburg soils. These soils are in depressions and swales.

Most areas of this complex are artificially drained by sewer systems, gutters, and subsurface drains. In areas of the Rossmoyne soil that are not artificially drained, a perched seasonal high water table is between depths of 18 and 36 inches in winter and in spring and other extended wet periods. Permeability of the Rossmoyne soil is moderate above the fragipan and slow in and below the fragipan. Root growth in this soil is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is low. Runoff is slow. The potential for frost action is high. This soil is highly corrosive to uncoated steel and concrete.

The Rossmoyne soil makes up the parks, open space, lawns, and gardens. It is suited to lawns, vegetable and flower gardens, trees, and shrubs. In some years, planting of vegetable and flower gardens is delayed because of the wetness of the soil. Subsurface drains are needed to remove excess water from the soil. Perennials selected for planting should be tolerant of a restricted root zone. Vegetation is difficult to establish in the small areas that have been cut and filled unless these areas are blanketed with topsoil.

The Rossmoyne soil is moderately well suited to use as a site for buildings and is poorly suited to use as septic tank absorption fields. Most sanitary facilities are connected to sewers and sewage treatment facilities. The Rossmoyne soil can be used as septic tank absorption fields if an absorption area that is larger than normal is used or if alternating absorption fields are used. This soil is better suited to houses without basements than to houses with basements. Building sites should be landscaped so surface water drains away from foundations and septic tank absorption fields. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. The use of this soil for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. These limitations can be overcome by providing suitable base material and artificial drainage. Play areas and walkways need special surfacing because the soil is sticky when wet. Onsite investigation is needed to properly evaluate a site for a specific use.

The Rossmoyne soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

RtB—Rossmoyne-Urban land complex, 3 to 8 percent slopes. This complex consists of a deep, gently sloping, moderately well drained Rossmoyne soil and Urban land. It is on the Illinoian till plain. Areas of this complex range from 5 to 1,000 acres in size and contain about 60 percent Rossmoyne silt loam and 30 percent Urban land. The areas of Rossmoyne soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Rossmoyne soil has a surface layer of brown, friable silt loam about 6 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 64 inches thick. The upper part of the subsoil is yellowish brown, mottled, friable and firm silty clay loam; the middle part is a fragipan consisting of yellowish brown, mottled, firm and very firm clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 92 inches is yellowish brown, mottled, firm clay loam glacial till. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of most areas, are small areas of somewhat poorly drained Avonburg soils in flatter areas and well drained Switzerland soils on the upper part of some slopes.

Most areas of this complex are artificially drained by sewer systems, gutters, and subsurface drains. In Rossmoyne soil areas that are not artificially drained, a perched high water table is between depths of 18 and 36 inches in winter and in spring and other extended wet periods. Permeability is moderate above the fragipan and slow in and below the fragipan. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is low. Runoff is medium. The potential for frost action is high. This soil is highly corrosive to uncoated steel and concrete.

The Rossmoyne soil makes up the parks, open space, lawns, and gardens. It is suited to lawns, vegetable and flower gardens, trees, and shrubs. The surface layer crusts after hard rains. Subsurface drains are needed in a few areas. Perennials selected for planting should be tolerant of a restricted root zone. Vegetation is difficult to establish in the included small areas that have been cut and filled unless these areas are blanketed with topsoil.

The Rossmoyne soil is moderately well suited to use as a site for buildings and poorly suited to use as septic tank absorption fields. Most sanitary facilities are connected to sewers and sewage treatment facilities. The Rossmoyne soil can be used as septic tank absorption fields if an absorption field that is larger than normal is used or if alternating absorption fields are used. This soil is better suited to houses without basements than to houses with basements. Building

sites should be landscaped so surface water drains away from foundations and septic tank absorption fields. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by providing suitable base material and artificial drainage. Play areas and walkways need special surfacing because the soil is sticky when wet. Onsite investigation is needed to properly evaluate a site for a specific use.

The Rossmoyne soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

RtC—Rossmoyne-Urban land complex, 8 to 15 percent slopes. This complex consists of a deep, strongly sloping, moderately well drained Rossmoyne soil and Urban land. It is on the Illinoian till plains. Areas of this complex range from 5 to 50 acres in size and contain about 60 percent Rossmoyne silt loam and 30 percent Urban land. The areas of Rossmoyne soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Rossmoyne soil has a surface layer of brown, friable silt loam about 6 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 62 inches thick. The upper part of the subsoil is yellowish brown, mottled, friable and firm silty clay loam; the middle part is a fragipan consisting of yellowish brown, mottled, very firm clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 92 inches is yellowish brown, firm clay loam glacial till. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of most areas, are narrow strips of well drained Switzerland soils on the upper part of slopes.

Most areas of this complex are artificially drained by sewer systems, gutters, and subsurface drains. In Rossmoyne soil areas that are not artificially drained, a perched high water table is between depths of 18 and 36 inches in winter and in spring and other extended wet periods. Permeability is moderate above the fragipan and slow in and below the fragipan of the Rossmoyne soil. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is low. Runoff is rapid. The potential for frost action is high. This soil is highly corrosive to uncoated steel and concrete.

The Rossmoyne soil makes up the parks, open space, lawns, and gardens. It is moderately well suited to lawns, vegetable and flower gardens, trees, and shrubs. Erosion is a severe hazard in disturbed areas. The surface layer crusts after hard rains. Subsurface drains are needed in a few areas. Perennials selected for planting should be tolerant of the restricted root zone. Vegetation is difficult to establish in the included small areas that have been cut and filled unless these areas are blanketed with topsoil.

The Rossmoyne soil is moderately well suited to use as a site for buildings and poorly suited to use as septic tank absorption fields. Most sanitary facilities are connected to sewers and sewage treatment facilities. Land shaping has been done in some areas. The use of the soil as septic tank absorption fields is limited by the seasonal wetness and the slow permeability. Those limitations can be partly overcome by using curtain drains and by using absorption areas that are larger than normal. Drains at the base of footings and exterior basement wall coatings will help prevent wet basements. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by using suitable base material and artificial drainage. Play areas and walkways need special surfacing because the soil is sticky when wet. Onsite investigation is essential to properly evaluate a site for a specific use.

The Rossmoyne soil is in capability subclass IIIe. It is not assigned to a woodland suitability subclass.

RwB2—Russell silt loam, 3 to 8 percent slopes, eroded. This deep, gently sloping, well drained soil is on the Wisconsinan till plains. Most areas are irregularly shaped and range from 5 to 75 acres in size. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer.

Typically, the surface layer is dark yellowish brown, friable silt loam about 7 inches thick. The subsoil is about 36 inches thick. The upper part of the subsoil is dark yellowish brown and brown, firm silty clay loam; and the lower part is dark yellowish brown, very firm clay loam. The substratum to a depth of about 72 inches is yellowish brown and light yellowish brown, firm loam glacial till. In some areas the soil is wetter and has gray mottling in the upper part of the subsoil. In some areas limestone bedrock is at a depth of 40 to 72 inches. In a few areas the loess mantle is thinner. In other areas the slope is 1 to 3 percent.

Included in mapping, and making up about 15 percent of most areas, are small areas where the soil is strongly sloping.

This soil has moderate permeability and high available water capacity. Runoff is medium. The organic matter

content is moderately low or moderate. The potential for frost action is high.

This soil is used mainly as pasture and cropland. It is well suited to corn, soybeans, wheat, and hay and to pasture and woodland. Erosion is a hazard if the soil is cultivated, however. Using minimum tillage and grassed waterways and planting cover crops reduce erosion. Regular addition of organic matter reduces surface crusting and increases fertility.

The use of this soil as pasture is effective in controlling erosion. Grazing when the soil is wet, however, causes surface compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is suited to building site development, sanitary facilities, and recreation uses. Excavations for foundations should be backfilled with soil material having a low shrink-swell potential. Sites for local roads can be improved by using suitable base material. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

RxB—Russell-Urban land complex, 3 to 8 percent slopes. This complex consists of a deep, gently sloping, well drained Russell soil and Urban land. It is on Wisconsinan till plains. Most areas of this complex range from 20 to 250 acres in size and contain about 60 percent Russell silt loam and 25 percent Urban land. The areas of Russell soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Russell soil has a surface layer of dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 36 inches thick. The upper part of the subsoil is dark yellowish brown and brown, firm silty clay loam; and the lower part is dark yellowish brown, very firm clay loam. The substratum to a depth of about 72 inches is yellowish brown and light yellowish brown, firm loam glacial till. It is mottled in the upper part. In some areas the soil is wetter and has gray mottling in the upper part of the subsoil. In a few areas shale or limestone bedrock is at a depth of 40 to 72 inches, and in some areas the loess mantle is thinner. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping are small areas of moderately well drained Dana soils that have a high organic matter content in the surface layer. Also included are small areas of strongly sloping soils and areas of Eden soils that are 20 to 40 inches deep to bedrock. Included soils make up about 15 percent of most areas.

The Russell soil has moderate permeability and high available water capacity. Runoff is medium. The organic matter content is moderate or moderately low, and the potential for frost action is high.

The Russell soil makes up the parks, open space, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a hazard because of the slope. Erosion is especially serious if the soil surface is disturbed and left bare. Disturbed areas, if not covered by topsoil, are difficult to vegetate. The subsoil and substratum material that is exposed has poor tilth. It is sticky when wet and hard when dry.

The Russell soil is suited to building site development, recreation uses, and most sanitary facilities. Sanitary facilities commonly are connected to sewers and sewage treatment facilities. Excavations for foundations should be backfilled with soil material having a low shrink-swell potential. Sites for local roads can be improved by using suitable base material. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss. Storm sewers are used to handle storm water runoff. Onsite investigation is needed to properly evaluate a site for a specific use.

The Russell soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

St—Stonelick fine sandy loam, frequently flooded. This deep, nearly level, well drained soil is on flood plains. Flooding may occur at any time of the year, but commonly occurs for very brief periods in fall, winter, and spring. Slope is 0 to 2 percent. Most areas are long and narrow or irregularly shaped and range from 5 to 150 acres in size.

Typically, the surface layer is brown, friable fine sandy loam about 10 inches thick. The substratum to a depth of about 72 inches is brown, calcareous, friable and very friable loam, fine sandy loam, loamy sand, and sandy loam. In a few areas the soil has more silt or clay and less sand in the substratum.

Permeability is moderately rapid, and available water capacity is low. Runoff is slow.

This soil is used mainly for cultivated crops. It is well suited to corn and soybeans and to grasses and legumes for hay and pasture. It is droughty, and yields of some crops are reduced in dry years. This soil is well suited to irrigation. Such measures as no-till planting will conserve moisture. The frequent very brief flooding damages wheat. Regular addition of organic matter will help conserve moisture in the soil and maintain the fertility of the soil. In some areas, a measure such as the use of riprap or the use of plant cover is needed to reduce streambank erosion.

This soil is well suited to trees. Many areas adjacent to the stream channels are wooded. The flooding is so brief that trees are generally not damaged.

This soil is generally unsuited to use as a site for buildings and sanitary facilities. Extensive recreation areas, such as picnic areas and hiking paths and trails, generally are not seriously damaged by floodwater.

This soil is in capability subclass IIIw and woodland suitability subclass 2o.

SwB2—Switzerland silt loam, 3 to 8 percent slopes, eroded. This deep, gently sloping, well drained soil is on ridgetops on uplands. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long and narrow, commonly less than 500 feet wide, and range from 5 to 60 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 55 inches thick. The upper part of the subsoil is brown and strong brown, friable silt loam and silty clay loam; the middle part is yellowish brown, mottled, firm clay; and the lower part is olive brown and light olive brown, firm and very firm silty clay. The substratum to a depth of about 99 inches is light olive brown, very firm silty clay.

Included in mapping are small areas of Ava, Cincinnati, and Rossmoyne soils, which have a fragipan, on the crest of the ridgetops. Also included are long narrow strips of moderately deep Eden soils on shoulder slopes. The included soils make up about 15 percent of most areas.

Permeability is moderate in the upper part of the soil and very slow in the middle and lower parts. The available water capacity is moderate or high. Runoff is medium. The surface layer is moderately low in organic matter content. The shrink-swell potential is high in the middle and lower parts of the soil. The soil is highly corrosive to concrete and moderately corrosive to untreated steel. The potential for frost action is high.

This soil is used as cropland. It is well suited to corn, soybeans, wheat, and hay. The surface layer crusts after hard rains. Erosion is a hazard in cultivated areas. Controlling erosion and maintaining good tilth and the organic matter content are the main management concerns. Using minimum tillage and grassed waterways and planting cover crops reduce erosion, increase organic matter content, and reduce crusting. Soil compaction occurs if tillage or harvesting is done when the soil is wet.

This soil is used as pasture and is well suited to this use. Grazing when the soil is wet, however, causes compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited to use as a site for buildings and poorly suited to use as septic tank absorption fields. Backfilling along foundations of buildings with basements with a material that has low shrink-swell potential and reinforcing basement walls and foundations will reduce damage from the shrinking and swelling of the soil. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by using a suitable base material. This soil can be used as septic tank absorption fields if an absorption area that is larger than normal is used. Concrete placed in this soil should be treated to reduce acid corrosion. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

SwC2—Switzerland silt loam, 8 to 15 percent slopes, eroded. This deep, strongly sloping, well drained soil is on the sides and ends of ridgetops on uplands. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long and narrow and range from 5 to 40 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 50 inches thick. The upper part of the subsoil is brown and strong brown, friable silt loam and silty clay loam; the middle part is yellowish brown, mottled, firm clay; and the lower part is olive brown and light olive brown, firm silty clay. The substratum to a depth of about 99 inches is light olive brown, very firm silty clay.

Included in mapping are small areas of Ava and Cincinnati soils, which have a fragipan, on the crest of ridgetops. Also included are long narrow strips of moderately deep Eden soils on shoulder slopes. The included soils make up about 10 percent of most areas.

Permeability is moderate in the upper part of the soil and very slow in the middle and lower parts. The root zone is deep. The available water capacity is high. Runoff is rapid. The surface layer is moderately low in organic matter. The shrink-swell potential is high in the middle and lower parts of the soil. The soil is highly corrosive to concrete and moderately corrosive to uncoated steel. The potential for frost action is high.

In some of the less sloping areas this soil is used for cropland. It is moderately well suited to corn, soybeans, wheat, and hay. There is an erosion hazard in cultivated areas, and the surface layer crusts after hard rains. Controlling erosion and maintaining good tilth and the organic matter content are the main management concerns. Using minimum tillage and grassed waterways and planting cover crops reduce erosion, increase organic matter content, and improve tilth. Soil

compaction occurs if tillage or harvesting is done when the soil is wet.

This soil is used mainly as pasture and is suited to this use. The use of this soil as pasture is effective in controlling erosion. Grazing when the soil is wet, however, causes compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees and to other vegetation that provides cover and food for wildlife. Plant competition can be reduced by spraying, mowing, or disking. Logging roads and skid trails should be laid out across the slope to reduce erosion.

This soil is moderately well suited to use as a site for buildings and poorly suited to use as septic tank absorption fields. Land shaping is needed in some areas. Buildings should be designed to conform to the natural shape of the land. Backfilling along foundations of buildings with basements with a material that has low shrink-swell potential and reinforcing basement walls and foundations reduce damage from the shrinking and swelling of the soil. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by using a suitable base material. Cut or filled areas are subject to hillside slippage. This soil can be used as septic tank absorption fields if a larger absorption area than normal is used and if leach lines are placed across the slope. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss. Concrete placed in this soil should be treated to reduce corrosion.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

SwD2—Switzerland silt loam, 15 to 25 percent slopes, eroded. This deep, moderately steep, well drained soil is on sides of ridges and on hillsides on uplands. Many areas are dissected by shallow waterways. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are long or fan shaped and 4 to 80 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 47 inches thick. The upper part of the subsoil is brown and strong brown, friable silt loam and silty clay loam; the middle part is yellowish brown, mottled, firm clay; and the lower part is olive brown and light olive brown, firm and very firm silty clay with mottles between depths of 38 and 46 inches. The substratum to a depth of about 99 inches is light olive brown, very firm silty clay.

Included in mapping, and making up about 15 percent of most mapped areas, are small areas of moderately deep Eden soils. These soils are on the lower part of the landscape.

Permeability is moderate in the upper part of the soil and very slow in the middle and lower parts. The available water capacity is moderate or high. Runoff is very rapid. The surface layer is moderately low in organic matter. The shrink-swell potential is high in the middle and lower parts of the subsoil. This soil is highly corrosive to concrete and moderately corrosive to uncoated steel. The potential for frost action is high.

This soil is used as pasture. It is poorly suited to corn and soybeans and moderately well suited to pasture plants. There is a severe erosion hazard in cultivated areas, and the surface layer crusts after hard rains. Using contour cultivation and returning crop residue to the soil help reduce erosion. Grazing when the soil is wet causes compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is used as woodland and is moderately well suited to trees. Logging roads and skid trails should be constructed on the contour where practical. Tree planting machinery can be used on this soil, but safety precautions are particularly necessary because of the steepness of slope. Plant competition can be reduced by spraying, mowing, or disking.

This soil is poorly suited to use as a site for buildings and generally unsuited to use as septic tank absorption fields. It is subject to slippage. Preventing ground water from saturating the soil and diverting surface water away from areas are good deterrents to landslides. Cutting toe slopes and placing fill or structures on slopes can cause slippage. Excavations on the lower part of most slopes are subject to seepage. The use of this soil as a site for local roads and streets is limited by the low strength of the soil. That limitation can be overcome by using suitable base material. Deep cuts expose clayey material that is high in content of flagstones and that is sticky when wet, hard when dry, and difficult to grade. Backfilling along foundations of buildings with a material that has low shrink-swell potential and reinforcing foundations and basement walls reduce damage from the shrinking and swelling of the soil. Concrete should be treated to prevent corrosion. A plant cover should be maintained on a site, if possible, during construction to reduce erosion. Sediment basins can be used at the base of slopes at construction sites. Paths and trails should be constructed on the contour, where possible, and steps should be used where paths go up and down the slope.

This soil is in capability subclass IVe and woodland suitability subclass 1r.

SxB—Switzerland-Urban land complex, 3 to 8 percent slopes. This complex consists of a deep, gently sloping, well drained Switzerland soil and Urban land. It

is on side slopes and ridgetops on uplands. Areas of this complex range from 4 to 200 acres in size and contain about 55 percent Switzerland silt loam and 35 percent Urban land. The areas of Switzerland soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Switzerland soil has a surface layer of brown, friable silt loam about 8 inches thick. The subsoil is about 55 inches thick. The upper part of the subsoil is brown and strong brown, friable silt loam and silty clay loam; the middle part is yellowish brown, mottled, firm clay; and the lower part is olive brown and light olive brown, firm silty clay. The substratum to a depth of about 99 inches is light olive brown, very firm silty clay. Some areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed for building sites and parking lots.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soil that identfication of the soils is not feasible.

Included in mapping, and making up about 10 percent of most mapped areas, are small areas of Ava, Cincinnati, and Rossmoyne soils, which have a fragipan, on the crests of the ridgetops and long narrow strips of moderately deep Eden soils on the lower parts of some mapped areas.

Permeability is moderate in the upper part of the soil and very slow in the middle and lower parts. The Switzerland soil has moderate or high available water capacity. Runoff is medium on this soil. The organic matter content is moderately low. Shrink-swell potential is high in the middle and lower parts of the soil. The potential for frost action is high.

The Switzerland soil makes up the parks, open space, lawns, gardens, and orchards. It is moderately well suited to lawns, vegetable and flower gardens, trees, shrubs, and landscaping. The surface layer puddles during rains and crusts when drying. Erosion is a hazard if the soil is disturbed and left bare. Disturbed areas, if not blanketed by topsoil, are difficult to vegetate. The subsoil and substratum material that is exposed has poor tilth. It is sticky when wet and hard when dry.

The Switzerland soil is moderately well suited to building site development and poorly suited to use as septic tank absorption fields. Low strength, shrink-swell potential, high potential for frost action, and clayey material in the lower part of the soil are limitations to those uses. The clayey material is difficult to excavate and grade. It is sticky when wet and hard when dry. Sites for local roads and streets can be improved by using suitable base material. Backfilling along foundations of buildings with basements with a material that has low shrink-swell potential and reinforcing basement walls and foundations reduce damage from the shrinking and swelling of the soil. Concrete should be treated to prevent corrosion. Gutters, waterways, and sewers are used in most areas. The Switzerland soil can be used as septic tank absorption fields if a larger absorption field than normal is used. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss. Onsite investigation is essential to properly evaluate a site for a specific use.

The Switzerland soil is in capability subclass IIe. It is not in a woodland suitability subclass.

SxC—Switzerland-Urban land complex, 8 to 15 percent slopes. This complex consists of deep, strongly sloping, well drained Switzerland soil and Urban land. It is on side slopes of upland ridges. Areas of this complex range from 5 to 60 acres in size and contain about 55 percent Switzerland silt loam and 35 percent Urban land. The areas of Switzerland soil and the areas of Urban land are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

Typically, the Switzerland soil has a surface layer of brown, friable silt loam about 6 inches thick. The subsoil is about 50 inches thick. The upper part of the subsoil is brown and strong brown, friable silt loam and silty clay loam; the middle part is yellowish brown, mottled, firm clay; and the lower part is olive brown and light olive brown, firm silty clay. The substratum to a depth of about 99 inches is light olive brown, very firm silty clay. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed for building sites and parking lots.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Included in mapping, and making up about 10 percent of most areas, are small areas of Ava and Cincinnati soils, which have a fragipan, on the crests of the ridgetops and long narrow strips of moderately deep Eden soils on the lower parts of some mapped areas.

Permeability is moderate in the upper part of the Switzerland soil and very slow in the middle and lower parts. The available water capacity is moderate or high. Runoff is rapid. The shrink-swell potential is high in the middle and lower parts of the soil. The potential for frost action is high.

The Switzerland soil makes up the parks, open space, lawns, gardens, and orchards. It is moderately well suited to grasses, flowers, vegetables, trees, and shrubs if erosion is controlled. The surface layer puddles during rains and crusts when dry. Because of the erosion hazard, the soil should not be disturbed and left bare. The included disturbed areas are difficult to vegetate if not blanketed by topsoil. Subsoil material, which may be exposed on the surface, has very poor tilth. It is sticky when wet and hard when dry.

The Switzerland soil is moderately well suited to building site development and poorly suited to use as septic tank absorption fields. Slope, low strength, high shrink-swell potential, high potential for frost action, and clayey material in the lower part of the soil are limitations to those uses. The clayey material is difficult to excavate and grade. It is sticky when wet and hard when dry. Gutters, waterways, and sewers are used in most areas. Land shaping has been done in some areas. Buildings should be designed to conform to the natural shape of the land. Cut and filled areas are subject to hillside slippage. Bench terraces are used in some areas for slope stability and erosion control (fig. 6). Sites for local roads and streets can be improved by using suitable base material to improve the strength of the roadbed and to reduce damage from frost action. Backfilling along foundations of buildings with basements with a material that has low shrink-swell potential and reinforcing basement walls and foundations reduce damage from the shrinking and swelling of the soil. Concrete structures should be treated to reduce corrosion. Runoff and erosion increase during construction; therefore, a plant cover should be maintained on a site, if possible, to reduce soil loss. Onsite investigation is essential to properly evaluate a site for a specific use.

Figure 6.—These bench terraces in an area of Switzerland-Urban land complex, 8 to 15 percent slopes, are used to stabilize the slope and reduce erosion.

The Switzerland soil is in capability subclass IIIe. It is not assigned to a woodland suitability subclass.

Ud—Udorthents, clayey. These somewhat excessively drained to moderately well drained, clayey soils make up the upper 2 to 4 feet of the soil material that covers areas of assorted trash, industrial waste, stones, bricks, and other nonperishable materials. The clayey cover material is commonly calcareous and contains a small amount of coarse fragments. Areas typically are along banks of stream valleys or on edges of terraces and range from 3 to 2,000 acres in size.

Both the available water capacity and the content of organic matter are very low. Most areas are susceptible to erosion. Instability of the soil cover material causes gullying and siltation. Conditions are generally poor for plant growth.

Some areas of Udorthents, clayey, are used for building sites. A few areas are suitable for development as open land or wildlife habitat or for recreation purposes. Some areas are idle and support scattered vegetation. Some areas are active sanitary landfills. Where a cover of plants is to be established and maintained, resurfacing of the site with more favorable soil material may be desirable. Adjacent undisturbed soils generally are good sources of suitable cover material.

Grasses and trees that are tolerant of droughtiness should be selected for planting. These soils are commonly so variable in properties and characteristics that onsite investigation is needed to determine hazards, limitations, and suitability for a specific use.

These soils are not assigned to a capability subclass or a woodland suitability subclass.

Uf—Udorthents, loamy. These soils are in areas that have been filled with assorted trash, including industrial waste, paper and fiber, plastics, and other, mostly soft, perishable materials. They typically occur along the side slopes of stream valleys or on slopes in the uplands, where there is several feet or more of local relief. An uneven, rolling surface characterizes most of these areas as they settle. A few areas release gas. Areas of these soils range from 3 to 300 acres in size.

These loamy soils are 2 to 4 feet thick and contain a small amount of coarse fragments. They are commonly a mixture of subsoil and calcareous substratum material from nearby soils. Physical condition is poor.

The available water capacity and organic matter content are very low. Erosion is a hazard in most areas. Where a cover of plants is to be established and maintained, spreading an adequate depth of favorable soil material provides a more suitable rooting zone. Adjacent undisturbed soils commonly are good sources of suitable cover material.

Some areas are used for a specific land use such as a building site. A few areas are potentially suitable for development as openland or wildlife habitat or for recreation purposes. Some areas are idle and support scattered vegetation. A few areas are planted to grasses. Some areas are active as sanitary landfills and are uncovered.

Grasses and trees that are tolerant of droughtiness should be used to provide plant cover. These soils are commonly so variable in properties and characteristics that onsite investigation is needed to determine hazards, limitations, and suitability for a specific use.

These soils are not assigned to a capability subclass or a woodland suitability subclass.

UgB—Urban land-Elkinsville complex, 3 to 8 percent slopes. This complex consists of Urban land and a deep, gently sloping, well drained Elkinsville soil. It is on terraces. Areas of this complex range from 20 to 500 acres in size and contain about 60 percent Urban land and 20 percent Elkinsville silt loam. The areas of Urban land and the areas of Elkinsville soil are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the Elkinsville soil has a surface layer of very dark grayish brown, friable silt loam about 5 inches thick. The subsurface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 49 inches thick. The upper and middle parts of the subsoil are dark yellowish brown, friable silt loam and silty clay loam; and the lower part is yellowish brown, friable loam. The substratum to a depth of about 80 inches is yellowish brown very friable loam. In some places there is more sand throughout the soil or slopes are 0 to 3 percent. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed.

Included in mapping, and making up about 20 percent of most areas, are a few small areas of Pate soils on slope breaks to the uplands and a few small areas of Huntington soils on flood plains.

Permeability is moderate in the Elkinsville soil. This soil has a deep root zone and high or very high available water capacity. Runoff is medium. The soil is highly corrosive to concrete. The potential for frost action is high.

The Elkinsville soil makes up the parks, open space, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a moderate hazard, especially if the soil is disturbed and left bare. Vegetation is difficult to establish in the included small

areas that have been cut and filled unless the areas are blanketed with topsoil. The cut and fill material is so variable in nature that no prediction can be made about its properties.

The Elkinsville soil is well suited to use as a site for buildings and recreation uses. Storm sewers and gutters have been installed in most areas. Most sanitary facilities are connected to sewers and sewage treatment facilities. Backfilling along building foundations with a material that has low shrink-swell potential and reinforcing foundations reduce damage from the shrinking and swelling of the soil. The use of the Elkinsville soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by using suitable base material. Plant cover should be maintained on a site, if possible, during construction to reduce erosion. Onsite investigation is needed to properly evaluate a site for a specific use.

The Elkinsville soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

UgC—Urban land-Elkinsville complex, 8 to 15 percent slopes. This complex consists of Urban land and a deep, strongly sloping, well drained Elkinsville soil. It is on terraces. Areas of this complex range from 20 to 100 acres in size and contain about 60 percent Urban land and 20 percent Elkinsville silt loam. The areas of Urban land and the areas of Elkinsville soil are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the Elkinsville soil has a surface layer of brown, friable silt loam about 4 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil is about 47 inches thick. The upper and middle parts of the subsoil are dark yellowish brown, friable silt loam and silty clay loam; and the lower part is yellowish brown, friable loam. The substratum to a depth of about 80 inches is yellowish brown, very friable loam. In some places there is more sand throughout the soil. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed.

Included in mapping, and making up about 20 percent of most areas, are small areas where the slope is 15 to 40 percent and small areas of Huntington soils on flood plains.

Permeability is moderate in the Elkinsville soil. This soil has a deep root zone and high or very high available water capacity. Runoff is rapid. The soil is highly corrosive to concrete. The potential for frost action is high.

The Elkinsville soil makes up the parks, open space, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a hazard because of the slope of the soil, especially where the soil is disturbed and left bare. Vegetation is difficult to establish in included small areas that have been cut and filled unless these areas are blanketed with topsoil. The cut and fill material is so variable in nature that no prediction can be made about its properties.

The Elkinsville soil is well suited to use as a site for buildings and moderately well suited to recreation uses. Most sanitary facilities are connected to sewers and sewage treatment facilities. Gutters and storm sewers have been installed in most areas. Land shaping has been done in some areas. Buildings should be designed to conform to the natural shape of the land. Backfilling along building foundations with a material that has low shrink-swell potential and reinforcing foundations reduce damage from the shrinking and swelling of the soil. The use of the Elkinsville soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by using a suitable base material. A plant cover should be maintained on a site, if possible, during construction to reduce erosion. Onsite investigation is needed to properly evaluate a site for a specific use.

The Elkinsville soil is in capability subclass IIIe. It is not assigned to a woodland suitability subclass.

Uh—Urban land-Huntington complex, frequently flooded. This complex consists of Urban land and a deep, nearly level, well drained Huntington soil on flood plains. Areas not protected are flooded for brief periods in winter and spring. Slope is 0 to 2 percent. Areas of this complex range from 20 to 200 acres in size and contain about 60 percent Urban land and 20 percent Huntington silt loam. The areas of Urban land and the areas of Huntington soil are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

The Urban land part of the complex mainly occupies built-up industrial areas. It is covered by streets, railroads, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the Huntington soil has a surface layer of dark brown, friable silt loam about 11 inches thick. The subsoil is about 57 inches thick. The upper part of the subsoil is brown, friable silt loam; and the lower part is dark brown, firm silty clay loam. The substratum to a depth of about 80 inches is dark brown, friable loam. In some places, the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed. Many areas have been protected from flooding by levees.

Included in mapping are small areas of Elkinsville soils on low outwash terraces. Also included, are soils that have short, nearly continuous slopes of 10 to 25 percent. These soils are adjacent to the Ohio River. Some of the included soils are protected from flooding. The included soils make up about 10 percent of the mapped areas.

The Huntington soil has a high water table between depths of 48 and 72 inches in winter and in spring and other extended wet periods. It has moderate permeability and high or very high available water capacity. Runoff is slow. The root zone is deep and slightly acid to mildly alkaline. The potential for frost action is high.

The Huntington soil makes up the parks, open space, lawns, and gardens. It is well suited to lawns, vegetable and flower gardens, trees, and shrubs. Soil erosion generally is a problem only in disturbed areas that are left bare. The surface layer crusts after hard rains. The areas filled with subsoil and substratum material from soils on uplands and terraces are very poorly suited to lawns and gardens. These materials have poor tilth. They are sticky when wet and very hard when dry.

The Huntington soil is generally unsuited to use as a site for buildings, sanitary facilities, and intensive recreation uses. Most sanitary facilities are connected to sewers and sewage treatment facilities. Most streets are paved and have curbs and storm sewers. Onsite investigation is essential to properly evaluate a site for a specific use. In the included areas that are protected from flooding the soil is suited to use as a site for buildings and intensive recreation uses.

The Huntington soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

UmB—Urban land-Martinsville complex, 3 to 8 percent slopes. This complex consists of Urban land and a gently sloping, well drained Martinsville soil. It is on outwash plains. Areas of this complex range from 20 to 250 acres in size and contain about 60 percent Urban land and about 20 percent Martinsville silt loam. The areas of Urban land and the areas of Martinsville soil are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the Martinsville soil has a surface layer of dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 35 inches thick. The upper part of the subsoil is yellowish brown, friable silty clay loam; the middle part is yellowish brown, firm clay loam; and the lower part is dark yellowish brown, firm sandy clay loam. The substratum to a depth of about 60 inches is yellowish brown, friable stratified loam, sandy clay loam, and sandy loam. In some areas the soil is slightly wetter and has gray mottling in the upper part of the subsoil. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction; and other small areas have been cut, built up, or smoothed. In a few areas the soil has slope of 0 to 3 percent.

Included in mapping, and making up about 20 percent of most areas, are small areas of Casco soils on the tops of knolls and ridges.

In the Martinsville soil, permeability is moderate and the available water capacity is high. Runoff is slow. The root zone is deep. The organic matter content is moderately low or moderate.

The Martinsville soil makes up the parks, open space, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a hazard, especially if the soil surface is left bare. Vegetation is difficult to establish in the included small areas that have been cut and filled unless these areas are blanketed with topsoil. The cut and fill material is so variable in nature that no predictions can be made about the properties.

The Martinsville soil is well suited to use as a site for buildings. Most sanitary facilities are connected to sewers and sewage treatment facilities. Extending foundations to the substratum and backfilling along building foundations with a material that has low shrink-swell potential reduce damage from the shrinking and swelling of the soil. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by replacing the subsoil with a suitable base material. Sloughing is a hazard in excavations. A plant cover should be maintained on the site as much as possible during construction to reduce runoff and erosion.

The Martinsville soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

UmC—Urban land-Martinsville complex, 8 to 15 percent slopes. This complex consists of Urban land and a deep, strongly sloping, well drained Martinsville soil. It is on outwash plains. Areas of this complex are 20 to 100 acres in size and contain about 60 percent Urban land and about 30 percent Martinsville silt loam. The areas of Urban land and the areas of Martinsville soil are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the Martinsville soil has a surface layer of dark grayish brown, friable silt loam that is about 5 inches thick. The subsoil is about 32 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam; the middle part is yellowish brown, firm clay loam; and the lower part is dark yellowish brown, firm sandy clay loam. The substratum to a depth of about 60

inches is yellowish brown, friable stratified loam, sandy clay loam, and sandy loam. In some places, the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed. In a few areas the slope is 15 to 25 percent.

Included in mapping, and making up about 10 percent of most areas, are small areas of Casco and Eldean soils.

Permeability in the Martinsville soil is moderate. The root zone is deep. The available water capacity is high, and runoff is medium. The organic matter content is moderately low or moderate.

The Martinsville soil makes up the parks, open space, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a hazard if the soil is disturbed and left bare. The surface layer crusts after hard rains. Vegetation is difficult to establish in the included small areas that have been cut and filled unless these areas are blanketed with topsoil. The cut and fill material is so variable in nature that no predictions can be made about the properties.

The Martinsville soil is suited to use as a site for buildings and moderately well suited to recreation uses. Land shaping has been done in some areas. Buildings should be designed to conform to the natural shape of the land. Extending building foundations to the substratum and backfilling along foundations with a material that has low shrink-swell potential reduce damage from the shrinking and swelling of the soil. The use of the Martinsville soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by replacing the subsoil with a suitable base material. Gutters and storm sewers are used in most areas. Most sanitary facilities are connected to sewers and sewage treatment facilities. Installing distribution lines in septic tank absorption fields on the contour will reduce seepage of the effluent to the soil surface. Sloughing is a hazard in excavations. A plant cover should be maintained on the site as much as possible during construction to reduce erosion.

The Martinsville soil is in capability subclass IIIe. It is not assigned to a woodland suitability subclass.

Uo—Urban land-Patton complex. This complex consists of Urban land and a deep, nearly level, poorly drained Patton soil. It is in lacustrine basins. Areas receive runoff from adjacent higher lying soils and are subject to ponding. Areas of this complex range from 100 to 500 acres in size and contain about 70 percent Urban land and 20 percent Patton silty clay loam. The areas of Urban land and the areas of Patton soil are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the Patton soil has a surface layer of very dark gray, friable silty clay loam about 7 inches thick. The subsurface layer is very dark gray, mottled, friable and firm silty clay loam about 13 inches thick. The subsoil is dark gray and dark grayish brown, mottled, firm silty clay loam about 17 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled, friable stratified silty clay loam and silt loam. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed.

Included in mapping, and making up about 10 percent of most areas, are small areas of Henshaw and Markland soils on rises and Wakeland and Genesee soils on flood plains.

Most areas of this complex are artificially drained by sewer systems, gutters, ditches, and subsurface drains. In Patton soil areas that are not drained, a high water table is near or above the surface of the soil in spring and other extended wet periods. The root zone is deep. Permeability is moderate or moderately slow in the Patton soil. The available water capacity is high or very high, and runoff is very slow or ponded. The organic matter content is high. The subsoil is highly corrosive to untreated steel. The potential for frost action is high.

The Patton soil makes up the parks, open space, lawns, and gardens. If artificially drained, the soil is well suited to lawns, vegetable and flower gardens, trees, and shrubs. Several methods of artificial drainage can be successfully used on this soil. The best method for a particular area should be selected by onsite investigation. Perennials selected for planting should be tolerant of wetness. Erosion is a problem only if the soil is disturbed and left bare. The cut and filled spots are not well suited to lawns and gardens. The subsoil material that is exposed in these areas has very poor tilth. It is sticky when wet and hard when dry.

In undrained areas, the Patton soil is poorly suited to use as sites for buildings and recreation uses. The poor natural drainage is the main limitation to these uses. Most sanitary facilities are connected to sewers and sewage treatment facilities. Drainage ditches and subsurface drains reduce ponding and lower the seasonal high water table. Landscaping building sites so that water drains away from foundations is beneficial. The Patton soil is better suited to buildings without basements than to buildings with basements. The use of the Patton soil as a site for local roads and streets is limited by the low strength of the soil, by the ponding, and by the hazard of frost action in the soil. Those limitations can be overcome by raising the site with well compacted base material and by providing drainage with side ditches and culverts. Onsite investigation is needed to properly evaluate a site for a specific use.

The Patton soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

UrB—Urban land-Rossmoyne complex, 0 to 8 percent slopes. This complex consists of Urban land and a deep, gently sloping, moderately well drained Rossmoyne soil. It is on Illinoian till plains. Areas of this complex range from 500 to 1,000 acres in size and contain about 65 percent Urban land and about 20 percent Rossmoyne silt loam. The areas of Urban land and the areas of Rossmoyne soil are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the soils is not feasible.

Typically, the Rossmoyne soil has a surface layer of dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 64 inches thick. The upper part of the subsoil is yellowish brown, mottled, friable and firm silty clay loam; the middle part is a fragipan consisting of yellowish brown, mottled, firm and very firm clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 92 inches is yellowish brown, mottled, firm clay loam glacial till. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed.

Included in mapping, and making up about 15 percent of most areas, are small areas of Avonburg, Cincinnati, and Bonnell soils. The somewhat poorly drained Avonburg soils are in flatter areas, and the well drained Cincinnati and Bonnell soils are on the side slopes along waterways.

Most areas of this complex are artificially drained by sewer systems, gutters, and subsurface drains. Areas of the Rossmoyne soil that are not drained have a perched high water table between depths of 18 and 36 inches in winter and in spring and other extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. Root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity of this zone is low. Runoff is medium. This soil has high potential for frost action. It is highly corrosive to uncoated steel and concrete.

The Rossmoyne soil makes up the parks, open space, lawns, and gardens. It is moderately well suited to grasses, flowers, vegetables, trees, and shrubs. Subsurface drains are needed in a few areas. Perennials selected for planting should be tolerant of a restricted root zone. Vegetation is difficult to establish in the small areas that have been cut and filled unless these areas are blanketed with topsoil.

The Rossmoyne soil is moderately well suited to use as a site for buildings and is poorly suited to use as septic tank absorption fields. Most sanitary facilities are connected to sewers and sewage treatment facilities. This soil is better suited to houses without basements than to houses with basements. Building sites should be landscaped so surface water drains away from foundations and septic tank absorption fields. Drains at the base of footings and exterior basement wall coatings help prevent wet basements. The use of this soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by providing suitable base material and artificial drainage. Play areas and walkways need special surfacing because the soil is sticky when wet. Onsite investigation is needed to properly evaluate a site for a specific use.

The Rossmoyne soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

Ux—Urban land-Stonelick complex, frequently flooded. This complex consists of Urban land and a deep, nearly level, well drained Stonelick soil. It is on flood plains (fig. 7). Flooding may occur at any time of the year but commonly occurs for very brief periods in fall, winter, and spring. The slope is 0 to 2 percent. Areas of this complex range from 20 to 100 acres in size and contain about 60 percent Urban land and 25 percent Stonelick fine sandy loam. The areas of Urban land and areas of Stonelick soil are so intricately mixed, or so small, that it is not practical to separate them at the scale used in mapping.

The Urban land part of the map unit is covered by streets, parking lots, buildings, and other structures. The soils in these areas are so altered or obscured that identification of specific soils is not feasible.

Typically, the Stonelick soil has a surface layer of brown, friable fine sandy loam about 10 inches thick. The substratum to a depth of about 72 inches is brown, calcareous, friable and very friable loam, fine sandy loam, loamy sand, and sandy loam. A few areas have more clay and less sand between depths of 10 and 40 inches in the substratum. In some places the soil has been radically altered. Some of the low areas have been filled or levelled during construction, and other small areas have been cut, built up, or smoothed.

Included in mapping, and making up about 15 percent of most areas, are small areas of well drained Martinsville soils on outwash terraces that are slightly above the flood plains. Some included soils are protected from flooding.

Permeability is moderately rapid, available water capacity is low, and runoff is slow.

The Stonelick soil makes up the parks, open space, lawns, and gardens. It is poorly suited to grasses, flowers, vegetables, or shrubs because of droughtiness

Figure 7.—Industrial and commercial development in an area of Urban land-Stonelick complex, frequently flooded. Bonnell soils are on the slope breaks along the sides of the valley.

and the flood hazard. Flooding is so brief, however, that trees are generally not damaged. Grasses, legumes, and shrubs selected for planting should have high drought tolerance and should be able to withstand frequent, brief flooding.

This Stonelick soil is generally not suited to use as a site for buildings, sanitary facilities, and intensive recreation uses. The frequent, very brief flooding and seepage severely limit the soil for these uses. Low intensity uses, such as parking lots and paths and trails, are generally not damaged by flooding. Most streets are paved and have curbs and storm sewers. Sanitary facilities commonly are connected to sewers and sewage treatment facilities. Onsite investigation is needed to properly evaluate a site for a specific use. The included soils that are protected from flooding are suited to use as sites for buildings and intensive recreation uses.

The Stonelick soil is in capability subclass IIIw. It is not assigned to a woodland suitability subclass.

Wa—Wakeland silt loam, occasionally flooded. This deep, nearly level, somewhat poorly drained soil is on flood plains. Flooding may occur at any time of the year but commonly occurs for brief periods in winter and spring. The slope is 0 to 2 percent. Areas are narrow and irregularly shaped and range from 2 to 25 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The substratum to a depth of about 60 inches is grayish brown and brown, mottled, friable and firm silt loam and loam.

Included in most areas are small areas of poorly drained soils in depressions and along former stream channels and well drained Genesee soils near the stream channel and on slightly higher positions on the flood plain. Also included are a few areas that are ponded for brief periods after the floodwater recedes. These inclusions make up about 15 percent of most areas.

This Wakeland soil has moderate permeability and very high available water capacity. Runoff is very slow. The root zone is deep. A seasonal high water table is between depths of 12 and 36 inches in winter and in spring and other extended wet periods. This soil dries slowly in the spring.

In most areas this soil is used as cropland or permanent pasture. This soil is moderately well suited to corn and soybeans and to grasses and legumes for hay and pasture. Flooding severely damages winter grain crops. Such crops as corn and soybeans can generally be grown without flood damage. Wetness delays planting in most years. Subsurface drains are needed to remove excess water from the subsoil, but suitable outlets are not available in some areas. Overgrazing or grazing when this soil is wet causes compaction and poor tilth.

In a few areas this soil is in woodland use. Species selected for planting should be tolerant of wetness. Plant competition can be reduced by spraying, mowing, or disking.

This soil is generally unsuited to use as a site for buildings, sanitary facilities, and intensive recreation uses because of the flood hazard and wetness. Extensive recreational facilities, such as golf fairways, hiking paths, and trails, generally are not damaged by floodwater. Placing rock riprap on streambanks or adding vegetation to the streambanks is needed to reduce erosion in some areas.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

WbA—Warsaw Variant sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on terraces and outwash plains. Most areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, very friable sandy loam about 7 inches thick. The subsurface layer is dark brown, friable sandy loam about 7 inches thick. The subsoil is about 17 inches thick. The upper part of the subsoil is dark brown, friable sandy loam; and the lower part is dark brown, friable gravelly sandy loam. The substratum to a depth of about 60 inches is yellowish brown, loose very gravelly loamy coarse sand. In some places the surface layer is gravelly sandy loam or is lighter colored. In a few places the subsoil has less clay.

Included in mapping, and making up about 10 percent of most areas, are small areas of Wea soils that have a thicker solum.

Permeability is moderate in the subsoil of the Warsaw Variant soil and very rapid in the substratum. The root zone is mainly moderately deep to sand and gravel. The available water capacity is low, and the organic matter content is high.

This soil is used mainly as cropland. In a few irrigated areas it is used for specialty crops, such as vegetables and melons. This soil is only moderately well suited to corn, soybeans, wheat, and oats because of droughtiness. It is suited to use as hayland, pasture, and woodland. Unless the soil is irrigated, crop yields are reduced during seasons of below-normal rainfall. This soil is better suited to early maturing crops than to crops that mature late in summer. Maintaining the organic matter content and increasing the available water capacity are major management concerns. Including meadow crops in the cropping system and returning crop residue to the soil help maintain the organic matter content and increase the available water capacity of the soil. This soil is well suited to grazing early in spring.

This soil is well suited to use as a site for buildings and recreation uses. The effluent from septic tank absorption fields and sanitary landfills drains freely and may pollute the underground water supply. The use of this soil as a site for local roads and streets is limited by the hazard of frost action in the soil. That limitation can be overcome by replacing the subsoil with a suitable base material. Sloughing is a hazard in excavations. During dry periods, this soil is droughty for lawns. The substratum of this soil is a good source of sand and gravel.

This soil is in capability subclass IIs. It is not assigned to a woodland suitability subclass.

WeA—Wea silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on stream terraces and outwash plains. Most areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 10 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 5 inches thick. The subsoil is about 44 inches thick. The upper part of the subsoil is brown and dark yellowish brown, firm silty clay loam and clay loam; and the lower part is dark yellowish brown and brown, friable and firm sandy loam. The substratum to a depth of about 70 inches is brown, loose very gravelly loamy sand.

Included in mapping are small areas of Martinsville soils that have a lighter colored surface layer and Warsaw Variant soils that have a thinner subsoil. These included soils make up about 15 percent of most mapped areas.

Permeability is moderate in the subsoil of the Wea soil and very rapid in the substratum. The root zone is deep. The available water capacity is high, and runoff is slow. The organic matter content is high.

This soil is used mainly for row crops. It is well suited to corn, soybeans, wheat, hay, pasture, and woodland. It can be tilled and grazed early in spring and is well suited to irrigation and minimum tillage practices. The surface layer crusts after hard rains. The main management concerns are maintaining high fertility and maintaining good soil structure. Planting cover crops and leaving crop residue on the surface help maintain tilth, increase the rate of water infiltration, and reduce crusting.

This soil is well suited to use as a site for buildings and to use as septic tank absorption fields. Extending foundations to the substratum and backfilling along foundations and footings with a material that has low shrink-swell potential reduce damage caused by the shrinking and swelling of the soil. The use of this soil as a site for local roads and streets is limited by the low strength of the soil. That limitation can be overcome by replacing the subsoil with a suitable base material. The substratum of this soil is a good source of sand and gravel.

This soil is in capability class I. It is not assigned to a woodland suitability subclass.

WhA—Whitaker loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on outwash and lacustrine terraces. Most areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 9 inches thick. The subsoil is about 36 inches thick. The upper part of the subsoil is brown, grayish brown, and gray, mottled, friable and firm clay loam; and the lower part is gray, dark grayish brown, and yellowish brown, mottled, firm and friable sandy clay loam. The substratum to a depth of about 60 inches is brown, mottled, firm silt loam. In some areas, the surface layer is sandy loam.

Included in mapping are a few areas of poorly drained Patton soils and moderately well drained Markland soils. These included soils make up about 15 percent of most mapped areas.

In the Whitaker soil, a seasonal high water table is between depths of 1 and 3 feet in winter and in spring and other extended wet periods. The root zone is deep. Permeability is moderate, and surface runoff is slow. The available water capacity is high. The soil is highly corrosive to steel and is moderately corrosive to concrete. The potential for frost action is high.

This soil is used mainly as cropland. It is well suited to corn, soybeans, wheat, and hay. Seasonal wetness is the main limitation of the soil for farming. Surface drains can be used to remove excess surface water, and subsurface drains can be used to lower the seasonal high water table. Returning crop residue to the soil and regularly adding other organic matter increase the rate of water infiltration and improve tilth and fertility. Tillage, planting, and harvesting operations should be performed with equipment that minimizes soil compaction.

This soil is suited to use as pasture. Varieties of grasses and legumes that are water tolerant are best for new seedings. Grazing when the soil is wet causes surface compaction and reduced yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is poorly suited to use as a site for buildings and to use as septic tank absorption fields. Seasonal wetness limits the soil for these uses. This soil is better suited to houses without basements than to houses with basements. Drainage ditches and subsurface drains are used to lower the water table if suitable drainage outlets are available. Building sites should be landscaped so surface water drains away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. The use of the soil as a site for local roads and streets is limited by the low strength of the soil and the hazard of frost action in the soil. Those limitations can be overome by providing suitable base material and artificial drainage.

This soil is in capability subclass IIw and woodland suitability subclass 3o.

XfA—Xenia silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on the broad flats on the Wisconsinan till plains. Most areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is about 37 inches thick. The upper part of the subsoil is yellowish brown and dark yellowish brown, mottled, friable silty clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 62 inches is light olive brown, mottled, friable loam glacial till. In a few areas the soil is better drained, and in some areas it is 40 to 72 inches deep to bedrock.

Included in mapping, and making up about 15 percent of most areas, are somewhat poorly drained Fincastle soils along waterways and in depressions and well drained Miamian soils on rises.

The seasonal high water table is between depths of 24 and 72 inches in spring and other extended wet periods. Permeability is moderately slow, available water capacity is high, and runoff is slow. This soil is highly corrosive to steel, and the potential for frost action is high.

This soil is used mainly as cropland and pasture. It is well suited to corn, soybeans, wheat, hay, and pasture plants. Row crops can be grown year after year if well managed. Regular addition of organic matter reduces surface crusting and increases soil fertility. Subsurface drains are needed in included wetter soils. Grazing when the soil is wet causes surface compaction, increases runoff, and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited to use as a site for buildings and recreation uses and poorly suited to use as septic tank absorption fields. Seasonal wetness and shrinking and swelling of the subsoil limit the use of this soil as a site for buildings. Draining surface water away from foundations and backfilling around foundations with soil material that has low shrink-swell potential help

overcome these limitations. Drains at the base of footings and exterior basement wall coatings are used to help prevent wet basements. Seasonal wetness and moderately slow permeability limit the use of this soil as septic tank absorption fields. Those limitations can be overcome by using curtain drains to lower the seasonal high water table and by using a larger absorption area than normal. The use of the soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by providing suitable base material and artificial drainage.

This soil is in capability class I and woodland suitability subclass 1o.

XfB2—Xenia silt loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is on the Wisconsinan till plains. Erosion has removed part of the original surface layer, and subsoil material has been tilled into the present surface layer. Most areas are irregular in shape and 5 to 100 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is about 37 inches thick. The upper part of the subsoil is yellowish brown and dark yellowish brown, mottled, friable and firm silty clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 62 inches is light olive brown, mottled, friable loam glacial till. In a few areas the soil is better drained and does not have gray mottles in the upper part of the subsoil. In some areas the loess mantle is thinner, and in a few areas the soil is 40 to 72 inches deep to bedrock.

Included in mapping, and making up about 10 percent of most areas, are small areas of somewhat poorly drained Fincastle soils along waterways and well drained Miamian soils on knolls.

The seasonal high water table is between depths of 24 and 72 inches in spring and other extended wet periods. Permeability is moderately slow, available water capacity is high, and runoff is medium. This soil is highly corrosive to steel. The potential for frost action is high.

This soil is used mainly as cropland and pasture. It is well suited to corn, soybeans, wheat, hay, and pasture plants. Erosion is a hazard if the soil is cultivated. Using minimum tillage and planting cover crops reduce erosion. Regular addition of organic matter reduces surface crusting and increases soil fertility.

The use of this soil as pasture is very effective in controlling erosion. Grazing when the soil is wet, however, causes surface compaction and excessive runoff and reduces yields. Proper stocking, pasture rotation, and restricted grazing when the soil is wet help keep the pasture plants and the soil in good condition.

This soil is well suited to trees. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited to use as a site for buildings and recreation uses and poorly suited to use as septic tank absorption fields. Seasonal wetness and shrinking and swelling of the subsoil limit the use of this soil as a site for buildings. Draining surface water away from foundations and backfilling around foundations with soil material that has low shrink-swell potential help overcome these limitations. Drains at the base of footings and exterior basement wall coatings are used to help prevent wet basements. Seasonal wetness and moderately slow permeability limit the use of this soil as septic tank absorption fields. Those limitations can be overcome by using curtain drains to lower the seasonal high water table and by using a larger absorption area than normal. The use of the soil as a site for local roads and streets is limited by the low strength of the soil and by the hazard of frost action in the soil. Those limitations can be overcome by providing suitable base material and artificial drainage.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

Prime farmland

Prime farmland, as defined by the U.S. Department of Agriculture, is the land best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high crop yields if acceptable farming methods are used. Prime farmland produces the highest yields with minimal inputs of energy and money, and farming it results in the least damage to the environment. Prime farmland is of major importance in satisfying the nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and it should be used with wisdom and foresight.

Prime farmland is either currently used for producing food or fiber or is available for this use. Urban or built-up land or water areas are not included.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It has favorable temperature and growing season and acceptable reaction. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods or frequently flooded during the growing season. Slope ranges mainly from 0 to 6 percent.

About 31,139 acres, or nearly 12 percent, of Hamilton County meets the soil requirements for prime farmland. Areas are throughout the county, but most are in the western part.

A continuing trend in land use in most parts of the county has been the loss of some prime farmland to transportation, industrial, and urban uses. The loss of prime farmland to other uses puts pressure on marginal land, which generally is more erodible, more droughty, more difficult to cultivate, and less productive.

The map units that make up prime farmland in Hamilton County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. Some map units are considered prime farmland only in areas that are adequately drained. The use and management of the soils is described in the section "Detailed soil map units."

The map units that meet the soil requirements for prime farmland are:

ArA	Ava silt loam, 0 to 3 percent slopes
AvA	Avonburg silt loam, 0 to 2 percent slopes (where drained)
DaB	Dana silt loam, 0 to 4 percent slopes
EpA	Eldean loam, 0 to 2 percent slopes
EpB2	Eldean loam, 2 to 6 percent slopes, eroded
FdA	Fincastle silt loam, 0 to 2 percent slopes (where drained)
FoA	Fox loam, 0 to 2 percent slopes
FoB2	Fox loam, 2 to 6 percent slopes, eroded
Gn	Genesee loam, occasionally flooded
HoA	Henshaw silt loam, 0 to 2 percent slopes
Hu	Huntington silt loam, occasionally flooded
Ju	Jules silt loam, occasionally flooded
Lg	Lanier sandy loam, occasionally flooded
MaB	Markland silty clay loam, 2 to 6 percent slopes
McA	Martinsville silt loam, 0 to 2 percent slopes
McB	Martinsville silt loam, 2 to 6 percent slopes
Pn	Patton silty clay loam (where drained)
PrA	Princeton sandy loam, 0 to 2 percent slopes
PrB	Princeton sandy loam, 2 to 6 percent slopes
RdA	Raub silt loam, 0 to 2 percent slopes
Rn	Ross loam, rarely flooded
RpA	Rossmoyne silt loam, 0 to 3 percent slopes
Wa	Wakeland silt loam, occasionally flooded (where drained)
WbA	Warsaw Variant sandy loam, 0 to 2 percent slopes
WeA	Wea silt loam, 0 to 2 percent slopes
WhA	Whitaker loam, 0 to 2 percent slopes (where drained)
XfA	Xenia silt loam, 0 to 2 percent slopes
XfB2	Xenia silt loam, 2 to 6 percent slopes, eroded

Use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and pasture

George A. Cummings, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The system of land capability classification used by the Soil Conservation Service is explained, and the estimated yields of the main crops and hay are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

New methods, practices, and systems for producing crops and pasture are likely to be introduced in the coming years. To keep current on the latest varieties, fertilizers, herbicides, tillage methods, etc., the reader should refer to the "Agronomy Guide" (*11*) published biannually by the Cooperative Extension Service.

Maintaining fertility.—Because many of the soils in the county, particularly the light colored ones, are somewhat acid and medium to low in content of plant nutrients, additions of lime and fertilizer are needed. Such additions should be based on the results of soil tests, on the need of the crop, and on the crop growth desired.

Use of crop residue.—Many of the soils in the county, particularly the light colored ones, are not naturally high in organic matter content. To offset this deficiency, all crop residue should be returned to the soil. If soybeans or other crops that produce little residue are grown, the cropping system should include cover crops and sod crops. Maintaining the organic matter content of soils helps to insure good soil structure and tilth.

Drainage.—About 14 percent of the county has soils that are limited in their suitability for farm crops by wetness. Part of this area is used for urban uses. These soils have a seasonal high water table or are periodically flooded. Some areas of the poorly drained soils are subject to ponding. Most of the seasonally wet soils on the uplands have a moderately slowly permeable or slowly permeable substratum. Because of the substratum, the soils are saturated in the upper 2 to 3 feet during winter and spring. Subsurface drains can be used in most of the wet soils if the substratum of dense, compact till is at sufficient depth to permit proper drainage. Crops respond well to artificial drainage on all of the somewhat poorly drained soils. The Fincastle and Raub soils are well suited to crops if the soils are properly drained. Subsurface drains, open ditches, and land smoothing are most commonly used to achieve drainage. A combination of some of these practices may be needed in some areas. Artificial drainage is not commonly needed for crop production on the Xenia, Ava, Dana, or other moderately well drained soils.

Control of erosion.—Many of the soils in the county, such as Ava, Bonnell, Cincinnati, and Parke soils, have a surface layer that is fairly high in silt content and low to moderate in organic matter content. Such a surface layer is highly susceptible to erosion. In about 69 percent of the county, erosion is a hazard. Part of this area is in urban uses. Exclusive of sloping Urban land, much of the acreage that is susceptible to erosion is eroded. Erosion control practices commonly used include terraces, grassed waterways, stripcropping on the contour, contour tillage, minimum tillage, use of crop residue, and maintenance of a close-growing plant cover.

Irrigation.—Irrigation is a specialized practice that requires very intensive management. Many soils in this county that are suited to crops are also suited to irrigation. Generally, soils well suited to irrigation absorb water readily, are not subject to erosion, and have adequate available water capacity. Among those soils considered suited to irrigation are the nearly level and gently sloping Eldean, Fox, Genesee, Jules, Lanier, Martinsville, Princeton, Ross, Stonelick, Warsaw Variant, and Wea soils.

Some industrial waste water can be used for irrigation after the pollutants have been removed by filtration. Sites for filtration have to be selected carefully to prevent contamination of the ground water. Some soils, such as Casco, Eldean, Fox, and Warsaw Variant soils, are too coarse textured in the subsoil and substratum or do not have a thick enough subsoil to insure adequate filtration.

Cropping systems.—A cropping system can be defined as the kind and sequence of crops and the appropriate cropland management. It may consist of a rotation that includes grasses and legumes, or it may consist of a single crop grown year after year.

A satisfactory cropping system improves or maintains the physical condition of the soil; protects the soil during critical periods when erosion usually occurs; and aids in the control of weeds, insects, and diseases.

As row crops are grown more intensively, the need for conservation measures increases accordingly. If contour stripcropping is used on sloping soils, such as Ava, Cincinnati, and Switzerland soils, a satisfactory system is a 4-year rotation consisting of a row crop, a small grain, and 2 years of meadow. If contour strips were not established, however, the row crop might not be satisfactory because erosion would be excessive.

Many farmers in Hamilton County are using minimum tillage as a management tool because much of the land is susceptible to erosion and because the cost of energy is increasing. There are many forms of minimum tillage in use, but in general they all reduce operation costs by allowing fewer passes through the field. Minimum tillage has been shown to reduce erosion, but insufficient data is available at this time to show the long range effect on crop yields.

Pasture management.—Most of the permanent pasture in the county is on soils on which erosion is a hazard. These soils generally are eroded, are low in natural fertility, and are in poor tilth. Some pasture is on soils that need artificial drainage. Soils that require artificial drainage for optimum growth of row crops also require drainage for optimum growth of pasture. The following general management suggestions apply to all or most of the soils in the county.

Many of the soils used for pasture in Hamilton County are already eroded. Control of erosion is particularly important during seeding operations, and mulch seeding or use of a companion crop can help to control further erosion. Artificial drainage, if needed, must be as well established for pasture as it is for row crops. The need for lime and fertilizer should be determined by soil tests.

Soil compaction, caused by grazing when the soils are wet, results in decreased growth of pasture. Tilling when the soil is at optimum moisture content also helps to reduce soil compaction. The productivity of a pasture and its ability to protect the surface of the soil are influenced by the number of livestock it supports, the length of time they graze, the season in which they graze, and rainfall distribution. Good pasture management includes the use of stocking rates that maintain key forage species, pasture rotation, deferred grazing, grazing at the proper season, and supplying ample water for livestock at strategic locations.

Yields per acre

George A. Cummings, district conservationist, Soil Conservation Service, and Bob Davis, county extension agent, Cooperative Extension Service, assisted in preparing this section.

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops

grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey (*14*). These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w,* or *s,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w,* or *s,* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

Woodland management and productivity

Hamilton County is in the north-central hardwood forest region. Such species as black oak, red oak, white oak, ash, beech, and sugar maple are common in the county. Scattered woodland covers about 27 percent of the land area, or 71,563 acres, and is mostly on steep soils that border the streams. Four-fifths of the woodland, or 57,250 acres, is in land capability classes III, IV, VI, and VII. Some areas of somewhat poorly drained and poorly drained soils on the uplands and a few areas on flood plains are used as woodland.

Most of the potential farmland and some marginal areas have been cleared for farming. Farming has been abandoned on the poorest soils, and these soils have reverted to woodland.

Through the years, timber apparently was harvested selectively. The best trees were cut, and trees of low potential remained. The present stand generally is of poor quality. If properly managed, however, most woodland in the county can increase in value. Although there are no commercial sawmills in the county, sawlogs occasionally are hauled to several small, semiportable saws scattered throughout the county. A small amount of hardwood pulpwood is marketed in Middletown. A large, important concentration of paper and fiber industries has developed over the years in the Miami River Valley, north of Hamilton, but these factories depend mostly on pulpwood from other sources.

Compared to the income from the sale of other farm products, income from the sale of wood products is small. Good quality logs of red oak, white oak, and black walnut are still being cut from the better managed woodland. Also, farm woodlots are still a source of wood for fireplaces and woodburning stoves and a source of rough construction lumber and edible nuts. The demand for clear, high-quality logs of sugar maple, white ash,

white oak and red oak, and black walnut has increased; consequently, there is need for planting new stands and improving the management of existing stands. The demand for fuel wood is also increasing and providing a ready market for low-value trees and logging waste.

Besides adding to farm income, woodland provides esthetic benefits that cannot be measured in monetary terms. Trees add natural beauty to the landscape, provide a more desirable environment, and contribute to the well-being and enjoyment of the people of the county.

Woodland is becoming increasingly more important for its recreational value. As the population increases, the need increases for woodland in which to camp, hike, and hunt.

The existence of the large metropolitan areas of Cincinnati, as well as the sizable areas of Norwood and Reading within the county, makes the development of green areas imperative. The proper use of wooded areas is increasingly important.

Suitable kinds of trees to plant and to favor in existing woodland depend, to a great extent, on drainage of the soils. Some trees grow well only on well drained or moderately well drained soils. Others grow best in moist areas.

Information on forest management is available from the Ohio Department of Natural Resources, Division of Forestry; the Cooperative Extension Service; and the Soil Conservation Service.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service; the Ohio Department of Natural Resources, Division of Forestry; or the Cooperative Extension Service or from a nursery.

Landscaping and gardening

Elton M. Smith, Jr., professor of horticulture, The Ohio State University; Bob Davis, county extension agent, Cooperative Extension Service; and George A. Cummings, district conservationist, Soil Conservation Service, assisted in preparing this section.

This section discusses soil and site properties that affect the growth of landscape plants and of flowers and vegetables in the survey area.

Landscaping

Table 9 lists examples of vines, ground cover, shrubs, ornamental and shade trees, grasses, and legumes that are suitable for use on the soils in the county. Users of table 9 should consult local nurserymen, horticulturists, landscape designers, extension agents, or horticultural references for the many additional species that can be used. The 1972 U.S. Department of Agriculture Yearbook, "Landscape for Living" (*15*) covers many aspects of landscaping in urban areas, especially the effects of pavement heat, salts, shade, and microclimates.

In many places in Hamilton County the soils have been disturbed during excavation and construction, and landscaping is possible only if special measures are taken to prepare the soil material for the plants. In areas of naturally steep slopes, cuts and fills may have altered the soils drastically. The soil descriptions in this report can help determine the properties of underlying material in cuts or can be used to determine the composition of fill or soil that has been moved only a short distance as a result of site preparation. The soils closest to structures are most likely to be radically altered. This is especially true in complexes containing Urban land and in miscellaneous land areas. The plant species in table 9 will ordinarily do well on the specified soil unless the soil has been severely altered physically or chemically. As many of the existing trees as possible should be left on a site during development (fig. 8).

The following factors also should be considered before plants for landscaping are selected:

Shade. Soils intermingled with Urban land, where the density of buildings is high, may be in shade much of the day, and plants on those soils do poorly unless they are shade tolerant. In areas of the Urban land complexes, therefore, shade patterns should be observed before plants are selected for planting.

Wetness. Some plants do not thrive in wet soils, such as Avonburg or Patton soils. One way to overcome the wetness limitation is to install subsurface drainage if the soil is permeable enough for excess water to move through the soil to the drain line. Another way is to bring in new soil and raise the plant beds to get a satisfactory rooting zone. Some low-lying areas are ponded by runoff from adjacent slopes. Diverting the runoff could solve this problem. In urban areas, alleviating wetness is sometimes difficult because property line restrictions limit the alternatives.

Restricted root zone. In some soils, the root zone is restricted by bedrock or a dense soil layer and usually does not hold enough water for plants throughout the growing season. If Avonburg, Cincinnati, Eden, Ava, or Rossmoyne soils are severely graded during construction, the underlying bedrock or the dense compact layer in the subsoil may be exposed or within a few inches of the surface. Most grading operations around homesites result in a greater degree of soil compaction than that in natural soils. The soils that have a root-restricting layer near the surface are also susceptible to frost action during freezing and thawing. If sloping, these soils may contribute sediment and surface runoff or seepwater to driveways and walks, causing wet, messy conditions in warm weather and an ice hazard in winter.

The thickness of a root zone can be increased by adding topsoil and by mixing organic matter into the surface layer of the soil. These practices also increase the available water capacity of the soil.

Gardening

The soils in this county are suited to many varieties of flowers and vegetables. Many of these plants have about the same soil requirements. This section discusses features of a good garden soil and the features that restrict the use of some soils. The 1977 U.S. Department of Agriculture Yearbook, "Gardening for Food and Fun" (*17*) is a source of information on plant-soil-climate relationships, vegetable gardening, fruit and nut growing, and home food preservation.

The most favorable soil for a garden is nearly level or gently sloping, loamy, and permeable. It is adequately aerated but has moderate or high available water capacity. It generally should be medium acid to neutral

Figure 8.—Many of the existing trees were left during the development of this area of Rossmoyne-Urban land complex, 3 to 8 percent slopes.

(pH 6.0 to 7.0). Some soils in Hamilton County are naturally very strongly acid to medium acid (pH 4.5 to 6.0) and require liming. The lime requirement can be determined by soil tests. Many soils in Hamilton County have a moderate to low organic matter content in the surface layer. Additions of peat moss, humus, or compost in the surface layer will benefit flowers and vegetables, regardless of the kind of soil indicated by the soil map.

The undisturbed or slightly disturbed soils in Hamilton County that are well suited to flower and vegetable gardens are the nearly level or gently sloping Ava, Dana, Elkinsville, Markland, Martinsville, Parke, Princeton, Russell, Switzerland, Wea, and Xenia soils. These soils are deep, well drained or moderately well drained, and easily tilled and have a moderate to very high available water capacity.

The Warsaw Variant and Eden soils are not as suitable because the available water capacity is lower than is needed for optimum growth. They do not hold enough water to carry flowers and vegetables through the normal growing season without irrigation.

Genesee, Huntington, Jules, Lanier, Ross, and Stonelick soils are subject to flooding. However, the

flooding generally occurs early in spring, so most vegetables can be grown without flood damage. In areas of Rossmoyne and Dana soils and other moderately well drained soils, planting is usually delayed in spring because of wetness. Avonburg, Fincastle, Henshaw, Patton, Raub, Wakeland, and Whitaker soils are also limited for gardening because of wetness. On these soils wetness may delay spring planting 2 to 4 weeks after the first frost-free day. Patton soils contain more clay in the surface layer than many other soils and, therefore, are more difficult to till. Whitaker soils tend to be just the opposite, having a loamy, easily tilled surface layer.

Casco gravelly loam, 8 to 15 percent slopes, is poorly suited to flowers and vegetable gardens because it contains many fine to coarse pebbles that interfere with tillage. Although it warms up earlier in spring than most other soils, it does not hold enough water for flowers and vegetables through the normal growing season without irrigation.

The moderately steep Bonnell, Casco, Eden, Hennepin, Markland, Miamian, Pate, and Switzerland soils and soils that have slope in excess of 15 percent are poorly suited to generally unsuited to gardens because of the slope.

Recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife habitat

Wildlife is an important natural resource of Hamilton County. The species most common in the county are deer, cottontail, fox squirrel, gray squirrel, raccoon, gray and red foxes, and many songbirds and other nongame birds (fig. 9). Most of the soils in the county are suitable for use as habitat for some kind of wildlife. Interested persons should contact the local game protector, the county agricultural extension agent, or a representative of the Soil Conservation Service for specific information about managing areas for wildlife.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect

Figure 9.—These deer are browsing in an area of Princeton sandy loam, 6 to 12 percent slopes, eroded. Deer are among the wildlife common to the county.

the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor (*1*). A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are foxtail, goldenrod, smartweed, ragweed, and fescue.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, beech, maple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are shrub honeysuckle, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine and spruce.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil

properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are duckweed, wild millet, willow, reed canarygrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and shallow ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Urban development and landslides

The landslides that occur in Hamilton County are of two types: rotational slumps and rapid earth flows. These slides occur where the soil material overlies interbedded shale and limestone bedrock. The bedrock is relatively impermeable to water, so that rain or water from other sources infiltrates the soil, percolates to the bedrock, and then flows along the soil-bedrock contact. The presence of the water increases the hydrostatic pressure within the soil, which lowers its bearing strength. When the soil becomes saturated with water, the weight of the soil mass is greater than the forces holding it in place, and the slide occurs.

Five factors commonly cause the landslides that have occurred in Hamilton County: the presence of the Kope bedrock formation, a source of water, poor soil drainage,

slope greater than 15 percent, and poor vegetative cover (*8*).

The Kope bedrock formation is an Ordovician gray shale with interbedded thin layers of limestone. Shale makes up more than 75 percent of the bedrock. Upon exposure, this shale weathers rapidly, slaking into a highly plastic, clayey mass that is very unstable. The formation is widely distributed throughout the county.

Without a source of water, the landslides in Hamilton County would not occur. The source of water may be natural, as from snow melt or spring rains, or may be man influenced, as from a broken water main or storm runoff collected in a blocked road ditch.

Poor internal drainage of the soil is a requirement for the landslides. The soil must retain the water until it approaches the saturation point for the slide to occur. If the water is drained away artificially through surface or subsurface drains, the slide should not develop.

In the past, the slides have occurred on slopes steeper than 15 percent. About 28 percent of the land in Hamilton County is on slopes steeper than 15 percent.

A poor vegetative cover has been noted at many slides. Plant roots, especially tree roots, help to anchor a soil in place. Many slides, however, have occurred on forested slopes. A good vegetative cover alone cannot stop the development of a landslide.

Some landslides occur naturally, but many occur because of alteration of the soil (*8*). Construction on slopes steeper than 15 percent should be avoided if possible. If construction on such a slope is necessary, disturb the slope as little as possible, even if it appears to be stable. Provide a drainage system that prevents saturation of the soil. Avoid placing fill on steep slopes, and never build on fill that is near steep slopes (fig. 10); the closer the slope, the greater the chance for a slide. Avoid disturbing the toe, or bottom portion, of a slope, as it helps to stabilize the entire slope (fig. 11). And finally, always seed the slope to grass or other vegetation as soon as possible after disturbance to help anchor the soil in place and to control erosion.

Building site development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary facilities

Hamilton County has 54 independent domestic wastewater treatment plants and collection systems. The largest system in the county, the Metropolitan Sewer District, serves most of the populated area of the county.

Figure 10.—Slippage caused by cutting and overloading an area of Eden flaggy silty clay loam, 40 to 60 percent slopes. The slippage plane is immediately above the underlying interbedded shale and limestone bedrock.

Municipal systems also serve Loveland, Glendale, and Harrison.

Soil properties and site features are important to the proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. They affect the design of a sanitary facility and the ease of its installation.

In Hamilton County, many of the private home-operated waste treatment systems are of the aerobic type, not of the anaerobic type, such as septic tanks. Where housing is concentrated, such as in suburban developments not accessible to central treatment plants, aerobic systems are generally used and, if properly maintained, function very well. Where housing

Figure 11.—Slippage of a road cut caused by the removal of the soil from the toe slope in an area of Eden-Urban land complex, 15 to 25 percent slopes.

concentration is minimal, such as in areas of rural farmsteads, and soil and site features are favorable, septic tank absorption fields are still used and generally function very well. As of 1977, 38 percent of the onsite waste treatment systems in Hamilton County were of the surface discharge, or aerobic, type; and 62 percent were of the subsurface discharge, or anaerobic, type.

Table 13 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive

or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain

sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the

construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering index properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains as much as 15 or 20 percent particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (*2*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical and chemical properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops.

They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, loamy very fine sands, or sapric organic soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. Hemic organic soil materials are also in this group. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. Hemic organic soil materials are also in this group. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. Fibric organic soil material is also in this group. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 17, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and water features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the

extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering index test data

Several of the soils in Hamilton County were tested by the State of Ohio Department of Transportation, Division of Highways, Testing Laboratory. Engineering test data are also available from nearby counties that have many of the same soils. These data and the Hamilton County data are on file at the Department of Agronomy, The Ohio State University, Columbus, Ohio; the Ohio Department of Natural Resources, Division of Lands and Soil, Columbus, Ohio; and the Soil Conservation Service, state office, Columbus, Ohio.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*16*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that have a Udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*13*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*16*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Ava series

The Ava series consists of deep, moderately well drained soils on side slopes on uplands. These soils formed in 30 to 45 inches of Peoria loess over an older loess that is underlain by a paleosol of Illinoian or earlier age. They have a fragipan. Permeability is moderately slow above the fragipan and very slow in the fragipan. Slope ranges from 0 to 15 percent.

In Hamilton County, the Ava soils are taxadjuncts to the Ava series because they have lower chroma mottles in the upper part of the subsoil than is defined in the

range for the Ava series. This difference, however, does not significantly alter the use or behavior of the soils.

Ava soils are similar to Rossmoyne soils and are commonly adjacent to Parke and Switzerland soils. Parke and Switzerland soils do not have a fragipan. Parke soils are redder in the lower part of the solum. Rossmoyne soils formed in a thinner loess mantle. In Switzerland soils, the lower part of the subsoil formed in residuum of Ordovician Shale and Limestone.

Typical pedon of Ava silt loam, 0 to 3 percent slopes, about 1.5 miles northeast of Delhi, in Delhi Township, about 2,700 feet west and 2,700 feet north of the southeast corner of sec. 30, F. R. 1, T. 3.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many roots; many pores; very strongly acid; abrupt smooth boundary.

B1—9 to 15 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct yellowish brown (10YR 5/8) and common medium faint brown (10YR 5/3) mottles; weak fine and medium subangular blocky structure; friable; many roots; many medium pores; dark brown (10YR 4/3) organic stains on faces of peds and lining pores and root channels; very strongly acid; clear smooth boundary.

B21t—15 to 23 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct yellowish brown (10YR 5/8) and many medium faint brown (10YR 5/3) mottles; moderate medium subangular blocky structure; friable; common fine roots; many fine pores; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; few pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid; clear smooth boundary.

B22t—23 to 33 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) coatings of A2 material on faces of peds; very strongly acid; clear wavy boundary.

Bx1—33 to 46 inches; yellowish brown (10YR 5/6) silt loam; moderate very coarse prismatic structure parting to moderate medium and coarse angular blocky; firm and brittle; few fine flattened roots between prisms; many fine vesicular pores; thick continuous grayish brown (10YR 5/2) clay films on faces of peds and lining pores; thin continuous light brownish gray (10YR 6/2) silt coatings on faces of prisms; thick gray (10YR 5/1) clay seams; very strongly acid; diffuse irregular boundary.

IIBx2—46 to 57 inches; yellowish brown (10YR 5/4) silt loam; moderate very coarse prismatic structure parting to moderate coarse angular blocky; very firm and brittle; thick continuous grayish brown (10YR 5/2) clay films on faces of peds and lining pores; thin continuous light brownish gray (10YR 6/2) silt coatings on faces of prisms; thick gray (10YR 5/1) clay seams; many very dark brown and black small concretions (iron and manganese oxides) on faces of peds; very strongly acid; diffuse irregular boundary.

IIBx3—57 to 66 inches; yellowish brown (10YR 5/4) silt loam; moderate very coarse prismatic structure parting to moderate coarse angular blocky; firm and brittle; thick continuous grayish brown (10YR 5/2) clay films on faces of peds and lining pores; thin continuous light brownish gray (10YR 6/2) silt coatings on faces of prisms; thick gray (10YR 5/1) clay seams; common very dark brown and black stains and small concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

IIB31t—66 to 76 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium and coarse subangular blocky structure; firm; light gray (10YR 6/1) and strong brown (7.5YR 5/8) vertical seams and pockets; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; common black stains (iron and manganese oxides) on faces of peds; strongly acid; diffuse wavy boundary.

IIIB32t—76 to 86 inches; brown (7.5YR 5/4) and strong brown (7.5YR 5/6) silty clay; weak coarse subangular blocky structure; firm; brown (7.5YR 5/2) vertical seams; thin patchy gray (10YR 5/1) clay films on faces of peds; few black stains (iron and manganese oxides) on faces of peds; medium acid; clear wavy boundary.

IIIC1—86 to 96 inches; dark yellowish brown (10YR 4/4) clay; weak coarse subangular blocky structure; firm; gray (10YR 5/1 and 6/1) vertical seams; few black stains (iron and manganese oxides) on faces of peds; medium acid; diffuse irregular boundary.

IIIC2—96 to 118 inches; strong brown (7.5YR 5/6) clay; common medium faint yellowish brown (10YR 5/8) and common medium distinct light gray (10YR 6/1) and grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; common stains (iron and manganese oxides) on faces of peds; neutral; gradual irregular boundary.

IIIC3—118 to 131 inches; light brownish gray (2.5Y 6/2) silty clay; many coarse distinct strong brown (7.5YR 5/8) and light gray (10YR 6/1) mottles; massive; firm; common black or very dark brown (10YR 2/2) stains (iron and manganese oxides) on faces of peds; hard rock at 131 inches; neutral at 118 to 125 inches, mildly alkaline at 126 to 131 inches.

Solum thickness ranges from 60 to 90 inches. Depth to the fragipan ranges from 25 to 40 inches. Thickness of the fragipan ranges from 24 to 50 inches. The thickness of the Peoria loess ranges from 30 to 45 inches. Depth to the paleosol ranges from 60 to 90 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam.

The Bx horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam.

The B3t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay or silty clay loam.

The C horizon has hue of 2.5Y to 7.5YR, value of 4 to 6, and chroma of 2 to 8. It is silt loam to clay.

Avonburg series

The Avonburg series consists of deep, somewhat poorly drained soils on till plains. These soils formed in loess and the underlying Illinoian glacial till. These soils have a fragipan. Permeability is moderate above the fragipan and very slow in and below the fragipan. Slope is 0 to 2 percent.

Avonburg soils commonly are adjacent to Rossmoyne soils and are similar to Fincastle soils. Fincastle soils formed in Wisconsinan glacial till and loess and do not have a fragipan. Rossmoyne soils do not have dominant low chroma in the matrix or on faces of peds in the argillic horizon.

Typical pedon of Avonburg silt loam, 0 to 2 percent slopes, in the city of Blue Ash, in Sycamore Township, about 300 feet east and 1,500 feet south of the center of sec. 17, R. 1, T. 4.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 5/2) dry; moderate fine and medium granular structure; friable; many roots; slightly acid; abrupt smooth boundary.

A2—9 to 14 inches; brown (10YR 5/3) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium platy structure; friable; common roots; few fine very dark brown (10YR 2/2) concretions (iron and manganese oxides); slightly acid; clear smooth boundary.

B2tg—14 to 25 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak medium subangular blocky structure; friable; thin patchy light brownish gray (10YR 6/2) clay films and silt coatings on faces of peds and in pores; common fine very dark brown (10YR 2/2) concretions (iron and manganese oxides); strongly acid; clear irregular boundary.

Bx1g—25 to 40 inches; grayish brown (10YR 5/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure; firm; thin to thick light gray (10YR 6/1) silt coatings on tops and vertical faces of prisms; many light gray (10YR 7/1) silt fillings in old root and crayfish channels; thin discontinuous gray (10YR 6/1) clay films on faces of peds and lining pores; prisms are separated by light gray (10YR 7/1) silt coatings; common very dark brown (10YR 2/2) concretions (iron and manganese oxides); compact and brittle; strongly acid; gradual wavy boundary.

IIBx2g—40 to 53 inches; grayish brown (10YR 5/2) clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure parting to weak thick and very thick platy; firm; prisms are separated by light gray (10YR 7/1) thin silt coatings; thin continuous gray (10YR 6/1) clay films on faces of peds and lining pores; common very dark brown (10YR 2/2) concretions (iron and manganese oxides); few small angular chert fragments; compact and brittle; strongly acid; gradual wavy boundary.

IIB3—53 to 75 inches; yellowish brown (10YR 5/4) clay loam; many coarse distinct gray (10YR 5/1) mottles; weak coarse prismatic structure; firm; thin patchy gray (10YR 6/1) clay films on faces of peds and lining pores; few small angular chert fragments; few very dark brown (10YR 2/2) concretions (iron and manganese oxides); medium acid; gradual wavy boundary.

IIC—75 to 85 inches; yellowish brown (10YR 5/4) clay loam; many coarse distinct gray (10YR 5/1) mottles; massive; firm; common angular glacial till fragments; few concretions (iron and manganese oxides); slightly acid in the upper part grading to mildly alkaline, slight effervescence in the lower part.

Thickness of the solum ranges from about 60 to 90 inches. Thickness of the loess mantle ranges from 20 to 48 inches. Depth to the fragipan ranges from about 22 to 36 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2.

The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4.

The B2 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 6. It is silt loam or silty clay loam. Reaction is strongly acid or very strongly acid.

The Bx horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 6. It is strongly acid or very strongly acid.

The B3 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 6. It commonly is clay loam but is clay where the till has a large component from Ordovician Limestone and calcareous clay shale. It is

strongly acid or medium acid in the upper part and medium acid or slightly acid in the lower part.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It commonly is clay loam but is clay where the till has a large component from Ordovician Shale and Limestone. It is medium acid or slightly acid in the upper part, grading to moderately alkaline at depths greater than 80 inches.

Bonnell series

The Bonnell series consists of deep, well drained; slowly permeable soils on uplands. These soils formed in loess and the underlying Illinoian glacial till. Slope ranges from 15 to 60 percent.

Bonnell soils are commonly adjacent to Cincinnati and Rossmoyne soils and are similar to Cincinnati soils. The Cincinnati soils commonly have a thicker solum. Cincinnati and Rossmoyne soils have a fragipan. Rossmoyne soils are moderately well drained and have mottles under the A horizon.

Typical pedon of Bonnell silt loam, 15 to 25 percent slopes, about 1 mile southeast of Bevis, in Colerain Township, about 100 feet west and 1,100 feet north of the southeast corner of sec. 10, R. 1, T. 2.

A1—0 to 5 inches; very dark brown (10YR 2/2) silt loam, very dark grayish brown (10YR 3/2) rubbed, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many roots; medium acid; clear smooth boundary.

A2—5 to 11 inches; grayish brown (10YR 5/2) silt loam, brown (10YR 5/3) rubbed; very weak medium platy structure parting to weak medium granular; friable; common roots; common black (10YR 2/1) worm channels; strongly acid; clear wavy boundary.

B1—11 to 16 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few roots; yellowish brown (10YR 5/6) silt coatings on faces of peds; strongly acid; clear wavy boundary.

B21t—16 to 20 inches; brown (7.5YR 5/4) silty clay loam; strong fine and medium subangular blocky structure; friable; few roots; thin patchy strong brown (7.5YR 5/6) clay films on vertical faces of peds; strongly acid; clear smooth boundary.

IIB22t—20 to 28 inches; brown (7.5YR 5/4) clay; strong fine and medium subangular blocky structure; firm; few roots; thin patchy strong brown (7.5YR 5/6) clay films on vertical faces of peds; yellowish brown (10YR 5/4) silt coatings on some faces of peds; 1 percent coarse fragments; very strongly acid; clear wavy boundary.

IIB23t—28 to 35 inches; yellowish brown (10YR 5/6) clay; strong medium subangular blocky structure; firm; few roots; thin continuous yellowish brown (10YR 5/6) clay films on faces of peds; tongues of strong brown (7.5YR 5/6) light silty clay loam; 2 percent coarse fragments; strongly acid; clear smooth boundary.

IIB24t—35 to 43 inches; yellowish brown (10YR 5/6) silty clay; strong medium and coarse subangular blocky structure; firm; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds; common black (10YR 2/1) concretions (iron and manganese oxides); 4 percent coarse fragments; strongly acid; clear smooth boundary.

IIB25t—43 to 52 inches; yellowish brown (10YR 5/4) silty clay; moderate coarse subangular blocky structure; very firm; thin very patchy brown (10YR 4/4) clay films on vertical faces of peds; common black (10YR 2/1) concretions (iron and manganese oxides); 4 percent coarse fragments; medium acid; clear wavy boundary.

IIC1—52 to 60 inches; yellowish brown (10YR 5/4) clay loam; massive; very firm; about 5 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

IIC2—60 to 72 inches; yellowish brown (10YR 5/4) clay loam; massive; very firm; about 5 percent coarse fragments; strong effervescence; mildly alkaline.

Solum thickness ranges from 50 to 70 inches. Thickness of the loess mantle ranges from 5 to 20 inches.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 2. Some pedons have an Ap horizon.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. Reaction ranges from medium acid to very strongly acid. Texture is silty clay loam, clay, silty clay, or clay loam.

The C horizon commonly has hue of 10YR, value of 5, and chroma of 3 or 4. It is clay loam or loam.

Casco series

The Casco series consists of deep, well drained soils on outwash terraces. These soils formed in loamy material and in the underlying calcareous sand and gravel. Permeability is moderate in the solum and very rapid in the substratum. Slope ranges from 8 to 70 percent.

Casco soils are commonly adjacent to Eldean, Fox, and Martinsville soils and are similar to Fox soils. Eldean, Fox, and Martinsville soils have a thicker solum than Casco soils.

Typical pedon of Casco loam, 35 to 70 percent slopes, about 1 mile north of Harrison, in Harrison Township, about 550 feet east and 1,525 feet south of the northwest corner of sec. 18, T. 2 N., R. 1 E.

A1—0 to 4 inches; dark brown (10YR 3/3) loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

B21t—4 to 10 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; thin patchy dark brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

B22t—10 to 15 inches; yellowish brown (10YR 5/4) gravelly clay loam; moderate medium subangular blocky structure; friable; thin patchy dark brown (7.5YR 3/2) clay films and organic coatings on faces of peds and pebbles; 15 percent coarse fragments; slight effervescence; mildly alkaline; abrupt wavy boundary.

C—15 to 60 inches; yellowish brown (10YR 5/4) very gravelly sand; loose; 60 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness typically is 14 to 18 inches and ranges from 10 to 24 inches. The A and B horizons are neutral or mildly alkaline.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. It is loam or gravelly loam.

The Bt horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. It is sandy clay loam, clay loam, heavy loam, gravelly loam, or gravelly clay loam.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is well sorted and is stratified in many pedons.

Cincinnati series

The Cincinnati series consists of deep, well drained soils that formed in loess and in the underlying Illinoian glacial till on till plains. These soils have a fragipan. Permeability is moderate above the fragipan and slow in and below the fragipan. Slope ranges from 3 to 15 percent.

Cincinnati soils are similar to Rossmoyne soils and are commonly adjacent to Eden, Rossmoyne, and Switzerland soils. Eden soils are moderately deep to shale and limestone bedrock. Rossmoyne soils are moderately well drained and have gray mottling in the upper 20 inches of the argillic horizon. Switzerland soils do not have a fragipan.

Typical pedon of Cincinnati silt loam, 8 to 15 percent slopes, eroded, about 2 miles southwest of Loveland, in Symmes Township, about 400 feet east and 3,250 feet south of the northwest corner of sec. 23, R. 1, T. 5.

Ap—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many roots; strongly acid; clear smooth boundary.

A2—3 to 7 inches; brown (10YR 5/3) silt loam; very weak medium platy structure parting to weak medium granular; friable; many roots; strongly acid; clear smooth boundary.

B1—7 to 13 inches; dark brown (7.5YR 4/4) light silty clay loam; moderate fine and medium subangular blocky structure; friable; many roots; very strongly acid; clear wavy boundary.

B21t—13 to 21 inches; dark brown (7.5YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; common roots; thin patchy dark brown (10YR 4/3) clay films on faces of peds; few fine very dark brown (10YR 2/2) stains (iron and manganese oxides); very strongly acid; clear wavy boundary.

B22t—21 to 30 inches; dark brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; common roots; thin patchy dark brown (10YR 4/3) clay films on faces of peds; few fine very dark brown (10YR 2/2) stains (iron and manganese oxides); very strongly acid; clear wavy boundary.

IIBx1—30 to 38 inches; dark brown (7.5YR 4/4) clay loam; few medium distinct yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to weak medium subangular blocky; firm, brittle; few roots along vertical faces of prisms; thin continuous light yellowish brown (10YR 6/4) silt coatings on faces of prisms; thin patchy dark brown (10YR 4/3) clay films on vertical faces of peds and thin patchy brown (10YR 5/3) clay films on horizontal faces of peds; few fine very dark brown (10YR 2/2)) concretions (iron and manganese oxides); 4 percent fine angular chert fragments; strongly acid; clear wavy boundary.

IIBx2—38 to 46 inches; dark brown (7.5YR 4/4) clay loam; many medium distinct strong brown (7.5YR 5/6) and few medium distinct gray (10YR 5/1) mottles; moderate very coarse prismatic structure parting to weak medium subangular blocky; firm, brittle; thin patchy light yellowish brown (10YR 6/4) silt coatings on faces of prisms; thin patchy brown (7.5YR 5/4) clay films on vertical faces of peds and thin very patchy brown (7.5YR 5/2) clay films on horizontal faces of peds; common fine very dark brown (10YR 2/2) concretions (iron and manganese oxides); 6 percent angular chert and quartz fragments; strongly acid; clear wavy boundary.

IIB31t—46 to 58 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct gray (10YR 5/1) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; thin very patchy light yellowish brown (10YR 6/4) silt coatings on faces of prisms; thin patchy brown (7.5YR 4/4) clay films on faces of peds; common fine and medium very dark brown (10YR 2/2) concretions (iron and manganese oxides); 8 percent coarse fragments; slightly acid; gradual wavy boundary.

IIB32—58 to 70 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure in upper part grading to massive in lower part; firm; thin very patchy dark gray (10YR 4/1) clay films on faces of peds in upper part; common fine very dark brown (10YR 2/2) concretions (iron and manganese oxides); 10 percent chert fragments; neutral; clear wavy boundary.

IIC—70 to 86 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; massive; firm; 12 percent coarse fragments; slight effervescence; mildly alkaline.

Solum thickness and depth to carbonates range from about 50 to 120 inches. The thickness of the loess mantle ranges from 20 to 38 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly silt loam but is silty clay loam in some pedons.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It ranges from silty clay loam to heavy loam.

The Bx horizon has colors similar to those in the B2t horizon. It is clay loam or light silty clay loam.

The B3 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loam or clay loam in which the clay content is 24 to 40 percent.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam or loam.

Dana series

The Dana series consists of deep, moderately well drained, moderately slowly permeable soils on the uplands. These soils formed in loess and in the underlying Wisconsinan calcareous glacial till. Slope ranges from 0 to 4 percent.

Dana soils are similar to Xenia soils and are commonly adjacent to Russell and Xenia soils. Russell and Xenia soils do not have a mollic epipedon.

Typical pedon of Dana silt loam, 0 to 4 percent slopes, in the village of Glendale, Sycamore Township, about 1,300 feet east and 1,950 feet north of the southwest corner of sec. 35, R. 1, T. 4.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

A12—8 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; common fine roots; medium acid; clear smooth boundary.

B21t—14 to 24 inches; brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure; friable; common fine roots; thin continuous dark brown (10YR 3/3) clay films on faces of peds; medium acid; gradual smooth boundary.

B22t—24 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam; few medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few roots; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

IIB23t—30 to 40 inches; yellowish brown (10YR 5/4) clay loam; few medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few roots; thin patchy grayish brown (10YR 4/2) clay films on faces of peds; 1 percent coarse fragments; neutral; clear smooth boundary.

IIB3—40 to 44 inches; dark yellowish brown (10YR 4/4) clay loam; few medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few roots; 2 percent coarse fragments; neutral; clear wavy boundary.

IIC—44 to 60 inches; dark brown (10YR 4/3) loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; 5 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 36 to 60 inches. The mollic epipedon ranges from 10 to 18 inches in thickness.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam or clay loam.

The C horizon has colors similar to those in the B horizon.

Eden series

The Eden series consists of moderately deep, well drained, slowly permeable soils on hillsides and narrow crests of ridges on uplands. These soils formed in residuum of interbedded soft, calcareous shale and

limestone bedrock (fig. 12). Slope ranges from 3 to 60 percent.

Eden soils are commonly adjacent to Cincinnati, Pate, and Switzerland soils and are similar to Pate soils. Cincinnati, Pate, and Switzerland soils are deep to bedrock.

Typical pedon of Eden silty clay loam, 25 to 40 percent slopes, about 2.5 miles southeast of Miamitown, in Green Township, about 1,000 feet west and 1,050 feet south of the northeast corner of sec. 35, F. R. 2, T. 2.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak fine subangular blocky structure parting to moderate medium granular; friable; neutral; clear smooth boundary.

B21t—5 to 10 inches; light olive brown (2.5Y 5/4) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; dark grayish brown (10YR 4/2) organic stains on faces of peds; about 10 percent flagstones of limestone; slightly acid; gradual smooth boundary.

Figure 12.—Deep cut in interbedded shale and limestone bedrock. Eden soils formed in residuum of this Ordovician formation.

B22t—10 to 16 inches; light olive brown (2.5Y 5/4) silty clay; strong medium subangular blocky structure; firm; thin patchy brown (10YR 5/3) clay films on faces of peds; about 12 percent flagstones of limestone; slightly acid; gradual smooth boundary.

B23t—16 to 23 inches; yellowish brown (10YR 5/4 and 5/6) and light olive brown (2.5Y 5/4) silty clay; strong medium subangular blocky structure; firm; continuous brown (10YR 5/3) clay films on faces of peds; about 14 percent flagstones of limestone; slightly acid; gradual smooth boundary.

B3t—23 to 28 inches; olive brown (2.5Y 4/4) and light olive brown (2.5Y 5/4) flaggy clay; few fine distinct grayish brown (2.5Y 5/2) mottles; weak coarse subangular blocky structure; firm; thin patchy brown (10YR 5/3) clay films on faces of peds; about 20 percent flagstones of limestone and calcareous coral stems; neutral; clear smooth boundary.

Cr—28 to 60 inches; light gray (10YR 7/2) interbedded limestone and calcareous shale bedrock; massive; thin layer of olive brown (2.5Y 4/4) and light olive brown (2.5Y 5/4) flaggy clay; strong effervescence; moderately alkaline.

Solum thickness and depth to paralithic contact range from 20 to 40 inches. The content of coarse fragments of mainly flagstones ranges from 0 to 10 percent by volume in the A horizon and 10 to 25 percent in the B horizon. The solum is slightly acid to moderately alkaline.

The A horizon generally is less than 6 inches thick. It has hue of 10YR or 2.5Y, value of 3, and chroma of 2 or 3. It is dominantly silty clay loam and flaggy silty clay loam but is heavy silt loam or silty clay in some pedons.

The B horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 3 to 6. Texture of the fine earth is silty clay, clay, or silty clay loam. A C horizon is present in some pedons.

The Cr horizon has hue of 5GY to 2.5Y, value of 4 to 6, and chroma of 1 to 4. The limestone makes up less than 40 percent of the horizon. The limestone layers are hard, fossiliferous, and up to 4 inches thick. They are separated by 5- to 20-inch-thick layers of shale.

Eldean series

The Eldean series consists of deep, well drained soils that formed in loamy material and the underlying stratified calcareous outwash sand and gravel on stream terraces and outwash plains. Permeability is moderate or moderately slow in the solum and rapid or very rapid in the substratum. Slope ranges from 0 to 12 percent.

Eldean soils are commonly adjacent to Casco, Martinsville, and Princeton soils and are similar to Fox soils. Casco, Fox, Martinsville, and Princeton soils have less clay in the solum. Casco soils have a thinner solum, and Martinsville and Princeton soils have a thicker solum.

Typical pedon of Eldean loam, 0 to 2 percent slopes, in the city of Harrison, Harrison Township, about 750 feet east and 1,000 feet north of the center of sec. 28, T. 2 N., R. 1 E.

Ap—0 to 7 inches; brown (7.5YR 4/2) loam, light yellowish brown (10YR 6/4) dry; weak fine granular structure; friable; common roots; neutral; abrupt smooth boundary.

B1—7 to 15 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; friable; common roots; 2 percent coarse fragments; slightly acid; clear wavy boundary.

B21t—15 to 24 inches; brown (7.5YR 4/4) heavy clay loam; moderate medium subangular and angular blocky structure; firm; few roots; thin patchy clay films on faces of peds; 2 percent coarse fragments; slightly acid; clear wavy boundary.

B22t—24 to 30 inches; brown (7.5YR 4/4) heavy clay loam; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; 10 percent coarse fragments; neutral; abrupt smooth boundary.

B3t—30 to 36 inches; reddish brown (5YR 4/3) gravelly clay loam; weak coarse subangular blocky structure; friable; thin very patchy clay films on faces of peds and bridging sand grains; 20 percent coarse fragments; strong effervescence; moderately alkaline; clear irregular boundary.

IIC—36 to 60 inches; yellowish brown (10YR 5/4) gravelly loamy sand; single grain; loose; 30 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 20 to 40 inches. Reaction ranges from neutral to medium acid in the upper part of the solum and from neutral to moderately alkaline near the contact with the C horizon. Gravel content ranges from 0 to 15 percent in the A horizon and in the upper part of the B2 horizon and in the B3 horizon.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. It is commonly loam but is gravelly loam in some pedons.

The B2t horizon has hue of 10YR or 5YR, value of 3 to 5, and chroma of 3 or 4. Texture of the fine earth fraction is clay loam or clay.

The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is commonly stratified and varies considerably in the proportion of sand and gravel.

Elkinsville series

The Elkinsville series consists of deep, well drained, moderately permeable soils on low outwash terraces. These soils formed in alluvium derived from Illinoian glacial drift and residuum of shale and sandstone. Slope ranges from 3 to 15 percent.

Elkinsville soils are similar to Martinsville and Parke soils and are commonly adjacent to Huntington soils. Huntington soils are on flood plains and do not have an argillic horizon. Martinsville soils have a higher base saturation in the lower part of the soil and more sand and less silt in the upper part of the subsoil. Parke soils are on high dissected terraces and have a thicker, redder argillic horizon and solum.

Typical pedon of Elkinsville silt loam in an area of Urban land-Elkinsville complex, 3 to 8 percent slopes, in the city of Cincinnati, about 850 feet east and 1,500 feet north of the southwest corner of sec. 36, F. R. 1, T. 3.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; medium acid; abrupt smooth boundary.

A2—5 to 11 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; medium acid; clear smooth boundary.

B1—11 to 20 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; medium acid; clear smooth boundary.

B21t—20 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; strongly acid; clear smooth boundary.

B22t—30 to 45 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; seams and pockets of dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2); strongly acid; clear smooth boundary.

IIB3—45 to 60 inches; yellowish brown (10YR 5/4 and 5/6) loam; weak medium subangular blocky structure; friable; seams and pockets of dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2); strongly acid; clear smooth boundary.

IIC—60 to 80 inches; yellowish brown (10YR 5/4) loam; massive; very friable; strongly acid.

Solum thickness ranges from 50 to 72 inches.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Reaction ranges from neutral to medium acid.

The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam, clay loam, silty clay loam, or sandy clay loam. The B2 and B3 horizons are strongly acid or very strongly acid.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is loam, fine sandy loam, or fine sand and is strongly acid or very strongly acid.

Fincastle series

The Fincastle series consists of deep, somewhat poorly drained soils on Wisconsinan till plains. These soils formed in a mantle of loess and in the underlying calcareous glacial till. Permeability is slow. Slope is 0 to 2 percent.

Fincastle soils are commonly adjacent to Russell and Xenia soils and are similar to Avonburg and Raub soils. Avonburg soils have a thicker solum and formed in loess and Illinoian till. Russell and Xenia soils are better drained and are less gray in the subsoil. Raub soils have a mollic epipedon.

Typical pedon of Fincastle silt loam, 0 to 2 percent slopes, about 2 miles northeast of New Haven, in Crosby Township, about 950 feet west and 150 feet south of the center of sec. 1, T. 2 N., R. 1 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

B1—8 to 13 inches; brown (10YR 5/3) heavy silt loam; common medium faint grayish brown (10YR 5/2) and common medium distinct dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; friable; strongly acid; clear wavy boundary.

B21t—13 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds and lining pores; few small dark brown (10YR 3/3) concretions and stains (iron and manganese oxides); medium acid; clear wavy boundary.

B22t—24 to 33 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on all faces of peds and lining pores; medium acid; gradual wavy boundary.

IIB23t—33 to 38 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak and moderate medium subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; 3 percent coarse fragments; neutral; gradual wavy boundary.

IIB3—38 to 42 inches; dark brown (10YR 4/3) clay loam; few medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; firm; 5 percent coarse fragments; few segregations of carbonates; slight effervescence; mildly alkaline; clear irregular boundary.

IIC—42 to 70 inches; yellowish brown (10YR 5/4) loam; common medium and coarse distinct grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The thickness of the loess mantle ranges from 20 to 40 inches. Solum thickness typically ranges from 40 to 50 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. An A2 horizon is present in some pedons. The A horizon ranges from slightly acid to strongly acid.

The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is loam or light clay loam.

Fox series

The Fox series consists of well drained soils on stream terraces and outwash plains. These soils formed in loamy outwash and in the underlying stratified calcareous sand and gravel, which is at a depth of 20 to 40 inches. Permeability is moderate in the solum and rapid or very rapid in the substratum. Slope ranges from 0 to 6 percent.

Fox soils are commonly adjacent to Casco and Martinsville soils and are similar to Casco, Eldean, Martinsville, and Warsaw Variant soils. Casco soils have a thinner solum and Martinsville soils have a thicker solum than Fox soils. Eldean soils contain more clay in the argillic horizon. Warsaw Variant soils have a mollic epipedon.

Typical pedon of Fox loam, in an area of Fox-Urban land complex, 0 to 3 percent slopes, about 3.25 miles northwest of Hooven, in Harrison Township, about 680 feet west and 1,020 feet north of the southeast corner of sec. 29, T. 2 N., R. 1 E.

Ap—0 to 8 inches; brown (10YR 4/3) loam, brown (10YR 5/3) dry; weak fine granular structure; friable; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21t—8 to 17 inches; dark yellowish brown (10YR 4/4) loam; weak medium and coarse subangular blocky structure; friable; thin patchy dark brown (10YR 4/3) clay films on faces of peds; 7 percent coarse fragments; slightly acid; clear wavy boundary.

B22t—17 to 28 inches; brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; friable; thin patchy brown (7.5YR 4/4) clay films on faces of peds; 10 percent coarse fragments; slightly acid; gradual wavy boundary.

B3t—28 to 34 inches; reddish brown (5YR 4/3) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; medium continuous reddish brown (5YR 4/3) clay films on faces of peds and in pores; 15 percent coarse fragments; neutral; abrupt wavy boundary.

C—34 to 60 inches; brown (7.5YR 4/4) very gravelly loamy sand; single grain; loose; 60 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 24 to 40 inches. The solum is slightly acid or medium acid in the upper part and is slightly acid to mildly alkaline in the lower part. Content of coarse fragments ranges from 0 to 20 percent in the solum.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is commonly loam but is sandy loam or silt loam in some pedons.

The B2t horizon has hue of 10YR to 5YR, value of 3 or 4, and chroma of 3 to 5. It is sandy clay loam, clay loam, or loam.

The C horizon ranges widely in the proportion of sand and gravel and the amount of material from limestone.

Genesee series

The Genesee series consists of deep, well drained soils that formed in loamy alluvium on flood plains. Permeability is moderate. Slope is 0 to 2 percent.

Genesee soils are commonly adjacent to Ross soils and are similar to Huntington, Jules, and Ross soils. Huntington and Jules soils have more silt and less sand between depths of 10 and 40 inches. Huntington and Ross soils have a mollic epipedon.

Typical pedon of Genesee loam, occasionally flooded, about 3 miles east of Harrison, in Crosby Township, about 500 feet west and 1,250 feet north of the center of sec. 22, T. 2 N., R. 1 E.

Ap—0 to 9 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

C1—9 to 16 inches; brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; neutral; clear smooth boundary.

C2—16 to 27 inches; brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; thin strata of sandy loam and silt loam; slight effervescence; mildly alkaline; gradual smooth boundary.

C3—27 to 35 inches; brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; thin strata of sandy loam and silt loam; strong effervescence; moderately alkaline; gradual wavy boundary.

C4—35 to 60 inches; brown (10YR 5/3) stratified loam and sandy loam; 5 percent coarse fragments; massive; friable; strong effervescence; moderately alkaline.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is neutral or mildly alkaline and contains free carbonates in some pedons.

The C horizon above 40 inches has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam, silt loam, or sandy loam. Below 40 inches, the C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. Texture becomes coarser with depth.

Hennepin series

The Hennepin series consists of deep, well drained soils on valley side slopes in dissected parts of glacial till plains. These soils formed in calcareous Wisconsinan glacial till. Permeability is moderately slow or slow. Slope ranges from 15 to 60 percent.

Hennepin soils are similar to Miamian soils and are commonly adjacent to Miamian and Russell soils. Miamian and Russell soils have an argillic horizon and a thicker solum. Russell soils also have a loess mantle.

Typical pedon of Hennepin silt loam, 35 to 60 percent slopes, in the city of Sharonville, Sycamore Township, about 600 feet east and 1,200 feet north of the center of sec. 24, R. 1, T. 4.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; many roots; 2 percent coarse fragments; strong effervescence; moderately alkaline; abrupt smooth boundary.

B2—2 to 12 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure parting to moderate medium and coarse granular; friable; 6 percent coarse fragments; strong effervescence; moderately alkaline; clear smooth boundary.

C—12 to 60 inches; dark yellowish brown (10YR 4/4) loam; massive; firm; 12 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 5 to 20 inches.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam or light clay loam.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6.

Henshaw series

The Henshaw series consists of deep, somewhat poorly drained, moderately slowly permeable soils on low stream terraces and in lacustrine valleys. These soils formed in silt loam and silty clay loam slack-water deposits. Slope is 0 to 2 percent.

Henshaw soils are similar to Whitaker soils and are commonly adjacent to Markland and Patton soils. Markland soils are on knolls and side slopes and are moderately well drained. They do not have low-chroma mottling immediately under the surface layer. Patton soils are wetter soils on flats and in depressions. They have a mollic epipedon. Whitaker soils have more sand and less silt in the subsoil.

Typical pedon of Henshaw silt loam, 0 to 2 percent slopes, about 1.7 miles northeast of Harrison, in Harrison Township, about 1,000 feet west and 500 feet south of the northeast corner of sec. 17, T. 2 N., R. 1 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many roots; slightly acid; clear smooth boundary.

B21t—8 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (2.5Y 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common roots; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—17 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (2.5Y 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; gradual smooth boundary.

B23t—24 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; common coarse distinct grayish brown (2.5Y 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few roots; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; many small concretions and stains (iron and manganese oxides); neutral; gradual smooth boundary.

B3tg—32 to 44 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; friable; thin very patchy dark brown (10YR 4/3) clay films on faces of peds; neutral; gradual smooth boundary.

C1g—44 to 52 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; massive; firm; slight effervescence; mildly alkaline; gradual wavy boundary.

C2g—52 to 66 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; slight effervescence; mildly alkaline.

Solum thickness ranges from 40 to 55 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Reaction is medium acid to neutral. Texture is silt loam or silty clay loam.

The B3 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2, or it has colors similar to those in the B2 horizon. Reaction is slightly acid to mildly alkaline. Texture is silt loam or silty clay loam.

The C horizon has colors similar to those in the B3 horizon. It is silty clay loam or silty clay.

Huntington series

The Huntington series consists of deep, well drained soils on flood plains. These soils formed in alluvium that washed from soils formed in material from shale, sandstone, and limestone. Permeability is moderate. Slope is 0 to 2 percent.

Huntington soils are commonly adjacent to Elkinsville soils and are similar to Genesee, Jules, and Ross soils. Elkinsville soils are on low outwash terraces and have an argillic horizon. Elkinsville, Genesee, and Jules soils have an ochric epipedon. Genesee and Ross soils have more sand and less silt between depths of 10 and 40 inches. Ross soils also have a thicker mollic epipedon than Huntington soils.

Typical pedon of Huntington silt loam, from an area of Urban land-Huntington complex, frequently flooded, in the city of Cincinnati, about 1,500 feet west and 500 feet north of the southeast corner of sec. 16, F. R. 1, T. 3.

Ap—0 to 11 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; many roots; neutral; clear smooth boundary.

B1—11 to 19 inches; brown (10YR 4/3) silt loam; weak medium granular structure; friable; many roots; dark brown (10YR 3/3) coatings on faces of peds; slightly acid; gradual wavy boundary.

B21—19 to 40 inches; dark brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few roots in upper part; few dark brown (10YR 3/3) coatings on faces of peds; slightly acid; gradual wavy boundary.

B22—40 to 68 inches; dark brown (7.5YR 4/4) silty clay loam; moderate coarse subangular blocky structure; firm; few dark brown (10YR 3/3) coatings on faces of peds; slightly acid; gradual wavy boundary.

C—68 to 80 inches; dark brown (7.5YR 4/4) loam; massive; friable; neutral.

Thickness of the mollic epipedon ranges from 10 to 18 inches. Reaction ranges from slightly acid to mildly alkaline throughout the soil.

The A1 or Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3.

The B2 horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 3 or 4. It is silt loam or silty clay loam.

The C horizon has colors similar to those of the B horizon but commonly contains more sand. It is loam, sandy loam, or gravelly sandy loam. In many pedons it is stratified.

Jules series

The Jules series consists of deep, well drained soils that formed in calcareous silty alluvium on flood plains. Permeability is moderate. Slope is 0 to 2 percent.

Jules soils are commonly adjacent to Genesee and Stonelick soils and are similar to Genesee, Huntington, and Ross soils. Genesee, Ross, and Stonelick soils have more sand and less silt between depths of 10 and 40 inches. Huntington and Ross soils have a mollic epipedon.

Typical pedon of Jules silt loam, occasionally flooded, about 2 miles southwest of Elizabethtown, in Whitewater Township, about 250 feet east and 1,125 feet north of the southwest corner of sec. 31, T. 1 N., R. 1 E.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

C1—9 to 30 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; strong effervescence; mildly alkaline; gradual smooth boundary.

C2—30 to 35 inches; brown (10YR 4/3) and dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; strong effervescence; mildly alkaline; gradual smooth boundary.

C3—35 to 60 inches; brown (10YR 4/3) silt loam; massive; friable; thin strata of fine sandy loam; strong effervescence; mildly alkaline.

The Ap horizon has hue of 10YR, value of 4, and chroma of 3 or 4.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

Lanier series

The Lanier series consists of deep, well drained soils that formed in alluvium on flood plains. Permeability is rapid or very rapid. Slope is 0 to 2 percent.

Lanier soils are commonly adjacent to Genesee and Stonelick soils that have an ochric epipedon.

Typical pedon of Lanier sandy loam, occasionally flooded, in Amberley village, Columbia Township, about 2,200 feet east and 225 feet south of the northwest corner of sec. 30, F. R. 2, T. 4.

A11—0 to 6 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many roots; 5 percent coarse fragments; strong effervescence; mildly alkaline; gradual smooth boundary.

A12—6 to 17 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak medium granular structure; friable; many roots; 10 percent coarse fragments; strong effervescence; moderately alkaline; clear smooth boundary.

IIC—17 to 72 inches; dark brown (10YR 4/3) stratified very gravelly loamy sand; single grain; loose; 60 percent coarse fragments; strong effervescence; moderately alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It commonly is sandy loam, but in some pedons it is loam. The A horizon is 10 to 24 inches thick.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The content of coarse fragments commonly increases with depth.

Markland series

The Markland series consists of deep, moderately well drained, slowly permeable soils that formed in lacustrine sediments on terraces. Slope ranges from 2 to 25 percent.

Markland soils are commonly adjacent to Henshaw and Xenia soils. Henshaw soils have low chroma mottles in the upper part of the argillic horizon. Xenia soils formed in loess and glacial till and have more silt and less clay in the upper part of the subsoil.

Typical pedon of Markland silty clay loam, 2 to 6 percent slopes, about 0.5 mile east of Miamitown, in Colerain Township, about 300 feet east and 1,875 feet north of the southwest corner of sec. 31, R. 1, T. 2.

Ap—0 to 10 inches; brown (10YR 4/3) silty clay loam; moderate medium granular structure; friable; many roots; strongly acid; abrupt smooth boundary.

B21t—10 to 16 inches; dark yellowish brown (10YR 4/4) silty clay, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; firm; few roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—16 to 24 inches; dark yellowish brown (10YR 4/4) silty clay; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin continuous dark brown (10YR 4/3) clay films on vertical faces of peds; mildly alkaline; clear smooth boundary.

B23t—24 to 29 inches; dark yellowish brown (10YR 4/4) silty clay; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin continuous dark grayish brown (10YR 4/2) clay films on vertical faces of peds; slight effervescence; moderately alkaline; clear smooth boundary.

B3t—29 to 33 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint yellowish brown (10YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin continuous dark brown (10YR 4/3) clay films on vertical faces of peds; slight effervescence; moderately alkaline; clear smooth boundary.

C1—33 to 40 inches; yellowish brown (10YR 5/6) silty clay; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; dark brown (10YR 4/3) coatings on faces of peds; strong effervescence; moderately alkaline; clear smooth boundary.

C2—40 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; massive parting to platy along thin laminations; firm; light gray (10YR 7/2) lime segregations between laminations; strong effervescence; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is dominantly silty clay, but subhorizons of silty clay loam are common in the upper or lower part.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It is silty clay or silty clay loam. It is stratified in some pedons.

Martinsville series

The Martinsville series consists of deep, well drained, moderately permeable soils. These soils formed in stratified silty and loamy outwash materials on stream terraces and outwash plains. Slope ranges from 0 to 15 percent.

Martinsville soils are similar to Elkinsville, Fox, and Princeton soils and are commonly adjacent to Eldean, Fox, Princeton, and Wea soils. Eldean and Fox soils have a thinner solum. Eldean soils have more clay in the argillic horizon. Elkinsville soils have a lower base saturation in the lower horizons and more silt and less sand in the upper part of the subsoil. Princeton soils formed in thick sandy and loamy deposits of eolian origin. Wea soils have a mollic epipedon.

Typical pedon of Martinsville silt loam, 0 to 2 percent slopes, about 1.25 miles northwest of Hooven, in Whitewater Township, about 1,500 feet east and 200 feet north of the southwest corner of sec. 9, T. 1 N., R. 1 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

B1t—9 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; medium acid; clear smooth boundary.

IIB21t—17 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous brown (10YR 4/3) clay films on faces of peds; medium acid; gradual wavy boundary.

IIB22t—24 to 34 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds and as lining in some pores; medium acid; clear smooth boundary.

IIB3—34 to 44 inches; dark yellowish brown (10YR 4/4) sandy clay loam; weak medium and coarse subangular blocky structure; firm; slightly acid; clear smooth boundary.

IIC1—44 to 54 inches; yellowish brown (10YR 5/4) stratified loam and sandy clay loam; massive; friable; neutral; clear smooth boundary.

IIIC2—54 to 60 inches; yellowish brown (10YR 5/4) sandy loam; massive; friable; thin strata of silt, sandy clay loam, and loam; slight effervescence; mildly alkaline.

Solum thickness ranges from 36 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam or clay loam in the upper part and clay loam or sandy clay loam in the lower part. The subhorizons range to loam or sandy loam.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is stratified with layers that are commonly loam, sandy clay loam, silt loam, or sandy loam.

Miamian series

The Miamian series consists of deep, well drained soils on Wisconsinan till plains. These soils formed in a thin layer of loess and the underlying glacial till. Permeability is moderately slow. Slope ranges from 8 to 35 percent.

Miamian soils are commonly adjacent to Hennepin and Russell soils and are similar to Eldean and Russell soils. Eldean soils have sand and gravel at a depth of 25 to 40 inches. They are in hummocky areas. Hennepin and Russell soils have less clay in the subsoil. They occupy positions similar to those of the Miamian soils.

Typical pedon of Miamian silt loam, 8 to 15 percent slopes, eroded, in the city of Sharonville, Sycamore Township, about 780 feet east and 825 feet north of the center of sec. 24, R. 1, T. 4.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

B21t—6 to 10 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine and medium subangular and angular blocky structure; friable; thin very patchy brown (10YR 4/3) clay films on vertical faces of peds; neutral; clear smooth boundary.

IIB22t—10 to 15 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular and angular blocky structure; firm; thin continuous brown (10YR 4/3) clay films on vertical faces of peds; about 5 percent coarse fragments; neutral; clear smooth boundary.

IIB23t—15 to 22 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous brown (10YR 4/3) clay films on vertical faces of peds; about 5 percent coarse fragments; many black (10YR 2/1) concretions and stains (iron and manganese oxides); neutral; clear smooth boundary.

IIB24t—22 to 27 inches; dark yellowish brown (10YR 4/4) clay loam; weak coarse subangular blocky structure; firm; thin patchy brown (10YR 4/3) clay films on vertical faces of peds; few fine black (10YR 2/1) concretions (iron and manganese oxides); about 5 percent coarse fragments; slight effervescence; mildly alkaline; clear smooth boundary.

IIC—27 to 60 inches; light olive brown (2.5Y 5/4) loam; massive; firm; about 10 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 20 to 40 inches, and depth to carbonates ranges from 18 to 40 inches. Reaction ranges from medium acid to neutral in the A horizon, strongly acid to neutral in the upper part of the B horizon, and slightly acid to mildly alkaline in the lower part. Coarse fragment content below the loess mantle is 2 to 15 percent by volume.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly silt loam but is silty clay loam in some pedons. Some pedons have a B1 horizon.

The IIB2 horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam or silty clay loam.

The IIC horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is light clay loam or loam glacial till.

Parke series

The Parke series consists of deep, well drained, moderately permeable soils on high, dissected terraces. These soils formed in loess and underlying old loamy deposits of either alluvial or lacustrine origin. Slope ranges from 3 to 35 percent.

Parke soils are similar to Elkinsville soils and are commonly adjacent to Ava, Eden, and Switzerland soils. Ava soils are moderately well drained and have a fragipan. Eden soils are moderately deep to shale and limestone bedrock. Elkinsville soils are on lower terraces and have a thinner argillic horizon and solum. Switzerland soils have a thinner solum. The lower part of

the solum of these soils formed in residuum of calcareous shale and limestone.

Typical pedon of Parke silt loam, 3 to 8 percent slopes, eroded, about 0.5 mile northeast of Cleves, in Miami Township, about 30 feet west and 1,300 feet south of the northeast corner of sec. 21, F. R. 2, T. 1.

Ap—0 to 9 inches; grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; friable; medium acid; abrupt smooth boundary.

A2—9 to 12 inches; brown (10YR 5/3) silt loam; weak thin platy structure; friable; very strongly acid; clear wavy boundary.

B1—12 to 18 inches; strong brown (7.5YR 5/6) silt loam; moderate fine subangular blocky structure; friable; very strongly acid; clear wavy boundary.

B21t—18 to 24 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

B22t—24 to 36 inches; strong brown (7.5YR 5/6) silty clay loam; moderate and strong medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; 4 percent small chert fragments and quartz pebbles; very strongly acid; diffuse wavy boundary.

IIB23t—36 to 41 inches; strong brown (7.5YR 5/6) clay loam; strong medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; 12 percent chert, quartz, and granite fragments; very strongly acid; diffuse wavy boundary.

IIB24t—41 to 48 inches; yellowish red (5YR 4/6) clay loam; strong medium subangular blocky structure; firm; thin patchy reddish brown (5YR 4/4) clay films on faces of peds; 8 percent chert, quartz, and granite fragments; very strongly acid; diffuse wavy boundary.

IIB25t—48 to 68 inches; yellowish red (5YR 4/6) clay loam; strong medium subangular blocky structure; firm; thin patchy reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; diffuse wavy boundary.

IIB26t—68 to 90 inches; yellowish red (5YR 4/6) clay loam; strong medium subangular blocky structure; firm; thin to thick continuous reddish brown (5YR 4/4) clay films on vertical faces of peds; strongly acid; gradual wavy boundary.

IIB31t—90 to 115 inches; yellowish red (5YR 5/6) silty clay loam; moderate coarse subangular blocky structure; firm; thin to thick continuous reddish brown (5YR 4/4) clay films on vertical faces of peds; strongly acid; gradual wavy boundary.

IIB32t—115 to 125 inches; yellowish red (5YR 5/6) clay loam; weak coarse subangular blocky structure; firm; thin continuous reddish brown (5YR 4/4) clay films on vertical faces of peds; strongly acid; clear wavy boundary.

IIB33t—125 to 145 inches; strong brown (7.5YR 5/8) stratified sandy clay loam and fine sandy loam; weak coarse subangular blocky structure; friable; thin patchy reddish brown (5YR 4/4) clay films on faces of peds; strongly acid.

Solum thickness is more than 72 inches. The solum ranges from medium acid to very strongly acid.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is dominantly silt loam but is loam in some pedons.

The B1 and B2 horizons are silt loam or silty clay loam. They have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6.

The IIB2 horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy clay loam, clay loam, or loam.

The IIB3 horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 6 to 8. It is silty clay loam, clay loam, sandy clay loam, or fine sandy loam.

Pate series

The Pate series consists of deep, moderately well drained soils on the lower part of hillsides on uplands. These soils formed in colluvium from interbedded shale and fossilized limestone. Permeability is very slow. Slope ranges from 8 to 35 percent.

Pate soils are commonly adjacent to Eden and Elkinsville soils and are similar to Eden and Switzerland soils. Eden soils, which are moderately deep to bedrock, are commonly on steeper slopes and on higher positions on the landscape than Pate soils. Elkinsville soils are on terraces along rivers and have more silt and less clay in the subsoil. Switzerland soils are well drained and have more silt and less clay in the upper part of the subsoil.

Typical pedon of Pate silty clay loam, 15 to 25 percent slopes, about 4.5 miles southwest of Cheviot, in Delhi Township, about 1,800 feet west and 600 feet south of the northeast corner of sec. 36, F. R. 1, T. 3.

Ap—0 to 10 inches; brown (10YR 4/3) silty clay loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

B1t—10 to 17 inches; brown (10YR 4/3) silty clay loam; few fine faint dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin patchy dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

B21t—17 to 24 inches; brown (10YR 5/3) silty clay; few fine faint dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin patchy dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—24 to 31 inches; yellowish brown (10YR 5/4) silty clay; moderate medium subangular and angular blocky structure; firm; few roots; thin patchy dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear smooth boundary.

B23t—31 to 37 inches; dark yellowish brown (10YR 4/4) silty clay; many pockets of dark brown (10YR 3/3) silt loam; weak medium prismatic structure parting to moderate medium angular and subangular blocky; firm; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few black concretions (iron and manganese oxides); medium acid; clear wavy boundary.

B24t—37 to 46 inches; brown (10YR 4/3) flaggy silty clay; weak medium prismatic structure parting to moderate medium angular and subangular blocky; firm; thin patchy dark brown (10YR 4/3) clay films on faces of peds; few black concretions (iron and manganese oxides); slightly acid; clear smooth boundary.

B3—46 to 54 inches; light olive brown (2.5Y 5/4) flaggy silty clay; moderate medium subangular blocky structure; firm; 20 percent coarse fragments; neutral in upper part, moderately alkaline and strongly effervescent in lower part; clear wavy boundary.

Cr—54 to 60 inches; rippable interbedded light olive brown limestone and gray shale bedrock.

Solum thickness ranges from 50 to 72 inches.

The Ap horizon has hue of 10YR and value and chroma of 3 or 4. It ranges from medium acid to neutral.

The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam, silty clay, or clay and flaggy analogs with 10 to 30 percent coarse fragments in the lower part. It commonly is medium acid to neutral.

Patton series

The Patton series consists of deep, poorly drained, moderately permeable or moderately slowly permeable soils in lacustrine basins. These soils formed in silty lacustrine sediments. Slope is 0 to 2 percent.

Patton soils are commonly adjacent to Genesee and Henshaw soils. Henshaw soils have less gray mottling in the upper part of the solum and do not have a mollic epipedon. Genesee soils are on flood plains and do not have a cambic horizon. Genesee and Henshaw soils do not have a mollic epipedon. Unlike Patton soils, Henshaw soils are somewhat poorly drained and are on flats and slight rises on low stream terraces and in lacustrine valleys.

Typical pedon of Patton silty clay loam in an area of Urban land-Patton complex, in the city of Sharonville, in Sycamore Township, about 1,650 feet west and 300 feet south of the northeast corner of sec. 36, R. 1, T. 4.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

A12—7 to 14 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; few fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

A13—14 to 20 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular and angular blocky structure; firm; neutral; clear smooth boundary.

B2g—20 to 29 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; neutral; clear smooth boundary.

B3g—29 to 37 inches; dark grayish brown (2.5Y 4/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; firm; slight effervescence; mildly alkaline; clear smooth boundary.

C1g—37 to 48 inches; variegated dark grayish brown (10YR 4/2), yellowish brown (10YR 5/6), and gray (10YR 5/1) stratified silty clay loam and silt loam; massive; friable; strong effervescence; moderately alkaline; clear smooth boundary.

C2g—48 to 60 inches; grayish brown (10YR 5/2) stratified silty clay loam and silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 24 to 42 inches thick. It is slightly acid to mildly alkaline throughout.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B horizon has hue of 10YR or 2.5Y, value of 4 or more, and chroma of 2 or less.

Princeton series

The Princeton series consists of deep, well drained soils that formed in thick deposits of sandy and loamy eolian material on broad terraces. Permeability is moderate. Slope ranges from 0 to 12 percent.

Princeton soils are similar to Martinsville soils and are commonly adjacent to Martinsville and Eldean soils. Eldean soils have more clay in the subsoil and more coarse fragments in the substratum. Martinsville soils formed in stratified silty and loamy outwash material and have a little more silt and clay in the subsoil.

Typical pedon of Princeton sandy loam, 0 to 2 percent slopes, about 1.5 miles west-southwest of New Haven, in Harrison Township, about 300 feet west and 2,100 feet south of the northeast corner of sec. 16, T. 2 N., R. 1 E.

Ap—0 to 10 inches; brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

B1—10 to 16 inches; dark yellowish brown (10YR 4/4) loam; weak fine and medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

B21t—16 to 23 inches; brown (7.5YR 4/4) sandy clay loam; moderate fine and medium subangular blocky structure; friable; thin patchy brown (7.5YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—23 to 31 inches; brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; thin patchy brown (7.5YR 4/2) clay films on faces of peds; few stains (iron and manganese oxides) in ped interiors; medium acid; clear smooth boundary.

B23t—31 to 40 inches; reddish brown (5YR 5/4) sandy loam; moderate medium subangular blocky structure; friable; thin patchy brown (7.5YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

B31—40 to 49 inches; reddish brown (5YR 5/4) sandy loam; weak coarse subangular blocky structure; friable; slightly acid; clear smooth boundary.

B32—49 to 57 inches; brown (7.5YR 4/4) sandy loam; weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.

C—57 to 75 inches; brown (7.5YR 5/4) stratified loamy sand and fine sand; single grained; loose; neutral.

Solum thickness ranges from 40 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

The B2t horizon has hue of 10YR to 5YR and value and chroma of 4 to 6. It is dominantly sandy clay loam and sandy loam, but subhorizons in some pedons are loam, clay loam, or fine sandy loam. Reaction in the B horizon commonly is medium acid but ranges from neutral to strongly acid.

The C horizon commonly is stratified loamy sand, fine sand, fine sandy loam, or coarse silt. It is neutral to moderately alkaline.

Raub series

The Raub series consists of deep, somewhat poorly drained, moderately slowly permeable soils on till plains. These soils formed in a mantle of loess and in the underlying calcareous Wisconsinan glacial till. Slope is 0 to 2 percent.

Raub soils are commonly adjacent to Dana, Fincastle, and Xenia soils and are similar to Fincastle soils. Dana and Xenia soils are moderately well drained and do not have gray mottles as close to the surface as do Raub soils. Fincastle and Xenia soils do not have a mollic epipedon.

Typical pedon of Raub silt loam, 0 to 2 percent slopes, in the city of Forest Park, in Springfield Township, about 1,850 feet east and 200 feet south of the northwest corner of sec. 19, R. 2, T. 2.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A12—9 to 13 inches; very dark grayish brown (10YR 3/2) silt loam, very dark grayish brown (10YR 3/2) dry; moderate medium granular structure; friable; many fine roots; neutral; clear smooth boundary.

B21t—13 to 18 inches; brown (10YR 4/3) silty clay loam; common fine faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; many fine roots; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—18 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

IIB23t—30 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; medium acid; clear smooth boundary.

IIB3—38 to 51 inches; brown (10YR 5/3) clay loam; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin very patchy grayish brown (10YR 5/2) clay films on faces of peds; few coarse fragments; slightly acid; clear wavy boundary.

IIC—51 to 60 inches; yellowish brown (10YR 5/4) light clay loam; few medium distinct grayish brown (10YR 5/2) mottles; massive; friable; 3 percent coarse fragments; strong effervescence; moderately alkaline.

The loess mantle is 22 to 40 inches thick, and the solum is 40 to 60 inches thick. The mollic epipedon ranges from 10 to 18 inches in thickness.

The Ap and A12 horizons range from medium acid to neutral.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It commonly is slightly acid to strongly acid but ranges to neutral in the lower part.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or clay loam.

Ross series

The Ross series consists of deep, well drained soils on flood plains and low terraces. These soils formed in recent loamy alluvium. Permeability is moderate. Slope is 0 to 2 percent.

Ross soils are commonly adjacent to Genesee and Stonelick soils and are similar to Genesee, Huntington, and Jules soils. Genesee, Jules, and Stonelick soils have an ochric epipedon. Huntington and Jules soils have more silt between depths of 10 and 40 inches. Huntington soils have a thinner mollic epipedon than Ross soils. Stonelick soils have more sand and less clay between depths of 10 and 40 inches.

Typical pedon of Ross loam, rarely flooded, about 1 mile northwest of Cleves, in Miami Township, about 1,250 feet east and 400 feet south of the northwest corner of sec. 21, F. R. 2, T. 1.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

A12—9 to 16 inches; dark brown (10YR 3/3) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; slight effervescence; mildly alkaline; clear smooth boundary.

B21—16 to 26 inches; dark brown (10YR 3/3) loam, grayish brown (10YR 5/2) dry; moderate fine and medium subangular blocky structure; friable; slight effervescence; mildly alkaline; clear smooth boundary.

B22—26 to 37 inches; brown (10YR 4/3) loam; moderate medium subangular blocky structure; friable; slight effervescence; moderately alkaline; clear wavy boundary.

C1—37 to 46 inches; dark yellowish brown (10YR 4/4) loam; massive; friable; strong effervescence; mildly alkaline; clear wavy boundary.

C2—46 to 60 inches; dark yellowish brown (10YR 4/4) loam; massive; friable; slight effervescence; moderately alkaline.

The solum and the mollic epipedon range from 24 to 40 inches in thickness.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is dominantly loam but is silt loam or sandy loam in some pedons.

The B horizon has hue of 10YR, value of 2 to 5, and chroma of 1 to 4. It is silt loam or loam.

The C horizon has hue of 10YR, value of 4, and chroma of 3 or 4. It is loam, sandy loam, or sandy clay loam. Some pedons have stratified sand and gravel below a depth of 40 inches.

Rossmoyne series

The Rossmoyne series consists of deep, moderately well drained soils that formed in loess and the underlying Illinoian glacial till on till plains. These soils have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slope ranges from 0 to 15 percent.

Rossmoyne soils are similar to Cincinnati soils and are commonly adjacent to Avonburg, Bonnell, Cincinnati, and Switzerland soils. Avonburg soils are somewhat poorly drained and have gray mottles immediately under the A horizon. Bonnell, Cincinnati, and Switzerland soils are well drained and do not have mottles immediately under the A horizon. Bonnell and Switzerland soils do not have a fragipan.

Typical pedon of Rossmoyne silt loam, 3 to 8 percent slopes, eroded, about 1.5 miles northwest of Blue Ash, in Sycamore Township, about 500 feet west and 2,900 feet north of the southeast corner of sec. 22, R. 1, T. 4.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light yellowish brown (10YR 6/4) dry; weak thick platy structure parting to moderate medium subangular blocky; friable; many roots; medium acid; abrupt smooth boundary.

A2—8 to 12 inches; brown (10YR 5/3) silt loam; weak thick platy structure; friable; common roots; many vesicular pores; very strongly acid; clear wavy boundary.

B1—12 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; few medium distinct pale brown (10YR 6/3) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common roots; very strongly acid; clear wavy boundary.

B2t—18 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct gray (10YR 5/1) mottles; moderate medium subangular blocky structure; firm; few roots; thin patchy brown (10YR 4/3) clay films on faces of peds; thin patchy light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; very strongly acid; clear wavy boundary.

IIBx1—26 to 38 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct gray (10YR 5/1) mottles; moderate very coarse prismatic structure parting to moderate thick platy; firm, brittle; few roots along faces of prisms; common tubular pores; medium continuous dark yellowish brown (10YR 4/4) clay films on horizontal planes; gray (10YR 5/1) clay films and thin patchy pale brown (10YR 6/3) silt coatings on vertical faces of prisms; 3 percent coarse fragments; very strongly acid; gradual wavy boundary.

IIBx2—38 to 49 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct gray (10YR 5/1) mottles; weak coarse prismatic structure parting to weak thick platy; very firm, brittle; medium patchy gray (N 5/0) and dark grayish brown (10YR 4/2) clay films on faces of prisms and lining pores; thin patchy dark yellowish brown (10YR 4/4) clay films on horizontal planes; thin patchy pale brown (10YR 6/3) silt coatings on vertical faces of prisms; common very dark brown (10YR 2/2) stains and concretions (iron and manganese oxides); 5 percent coarse fragments, mostly chert; strongly acid grading to slightly acid in lower part; clear wavy boundary.

IIB3t—49 to 76 inches; yellowish brown (10YR 5/4) clay loam; weak coarse subangular blocky structure; firm; few tubular pores; thin patchy dark yellowish brown (10YR 4/4) clay films on vertical faces of peds; common very dark brown (10YR 2/2) stains and concretions (iron and manganese oxides); 8 percent coarse fragments, mostly chert; neutral; clear wavy boundary.

IIC—76 to 92 inches; light olive brown (2.5Y 5/4) clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; massive; firm; few gray (10YR 6/1) streaks and seams; 10 percent coarse fragments; slight effervescence; mildly alkaline.

Solum thickness ranges from 60 to 100 inches, and the depth to the fragipan ranges from 18 to 30 inches. The loess mantle is 18 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B1 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam.

The IIBx horizon ranges from 16 to 30 inches in thickness. It has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It typically is clay loam or loam.

The IIB3 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 6. It ranges from loam to clay.

The IIC horizon has hue of 10YR or 2.5Y, value of 2 to 6, and chroma of 3 to 6. It ranges from loam to clay and has a coarse fragment content that ranges from about 5 to 30 percent.

Russell series

The Russell series consists of deep, well drained, moderately permeable soils on till plains. These soils formed in loess and in the underlying calcareous Wisconsinan glacial till. Slope ranges from 3 to 8 percent.

Russell soils are similar to Xenia soils and are commonly adjacent to Hennepin, Miamian, and Xenia soils. Hennepin soils have a shallow solum and do not have an argillic horizon. Miamian soils have a thinner loess mantle than Russell soils. Xenia soils, which are moderately well drained, have low chroma mottles within the upper 10 inches of the argillic horizon.

Typical pedon of Russell silt loam in an area of Russell-Urban land complex, 3 to 8 percent slopes, about 3 miles west of Forest Park, in Colerain Township, about 70 feet west and 550 feet south of northeast corner of sec. 6, R. 1, T. 2.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

B1—7 to 12 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; medium acid; clear smooth boundary.

B21t—12 to 17 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; thin patchy grayish brown (10YR 5/2) silt coatings on faces of some peds; thin patchy dark brown (10YR 4/3) clay films on vertical faces of peds; medium acid; clear smooth boundary.

B22t—17 to 22 inches; brown (7.5YR 4/4) silty clay loam; strong medium angular blocky structure; firm; thin patchy grayish brown (10YR 5/2) silt coatings on faces of some peds; thin patchy dark brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

IIB23t—22 to 28 inches; dark yellowish brown (10YR 4/4) clay loam; moderate coarse subangular blocky structure; very firm; thin continuous dark brown (10YR 4/3) clay films on vertical faces of peds; many fine very dark brown (10YR 2/2) concretions (iron and manganese oxides); slightly acid; clear smooth boundary.

IIB24t—28 to 34 inches; dark yellowish brown (10YR 4/4) clay loam; moderate coarse subangular blocky structure; very firm; thin continuous dark brown (10YR 4/3) clay films on vertical faces of peds; many fine very dark brown (10YR 2/2) concretions (iron and manganese oxides); slightly acid; clear smooth boundary.

IIB3t—34 to 43 inches; dark yellowish brown (10YR 4/4) clay loam; moderate coarse subangular blocky structure; very firm; thin continuous dark brown (10YR 4/3) clay films on vertical faces of peds; common fine very dark brown (10YR 2/2) concretions (iron and manganese oxides); slight effervescence in ped interiors; neutral; clear smooth boundary.

IIC1—43 to 50 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; firm; thin very patchy dark brown (10YR 4/3) clay films on vertical faces of peds; 1 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

IIC2—50 to 60 inches; light yellowish brown (10YR 6/4) loam; massive; firm; 2 percent coarse fragments; strong effervescence; moderately alkaline; diffuse wavy boundary.

IIC3—60 to 72 inches; light yellowish brown (10YR 6/4) loam; massive; firm; 3 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness and depth to carbonates range from 40 to 50 inches. The loess mantle ranges from 20 to 36 inches in thickness.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4. Reaction ranges from medium acid to neutral.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. Reaction ranges from very strongly acid to medium acid.

The IIBt horizon has colors similar to those in the Bt horizon. Reaction ranges from slightly acid to strongly acid in the upper part and neutral or slightly acid in the lower part.

The IIC horizon has hue of 10YR, value of 4 to 6, and chroma of 4 or 5. It is loam or clay loam.

Stonelick series

The Stonelick series consists of deep, well drained soils that formed in calcareous stratified alluvium on flood plains. Permeability is moderately rapid. Slope is 0 to 2 percent.

Stonelick soils are similar to Genesee soils and are commonly adjacent to Genesee and Jules soils. In contrast to Stonelick soils, Genesee soils have more clay and less sand in the C horizon above 40 inches. Jules soils have more silt and less sand in the C horizon above 40 inches.

Typical pedon of Stonelick fine sandy loam, frequently flooded, about 1 mile northwest of Cleves, in Miami Township, about 875 feet east and 390 feet south of the northwest corner of sec. 21, F. R. 2, T. 1.

Ap—0 to 10 inches; brown (10YR 4/3) fine sandy loam, brown (10YR 5/3) dry; weak fine granular structure; friable; 5 percent coarse fragments; slight effervescence; mildly alkaline; clear smooth boundary.

C1—10 to 20 inches; brown (10YR 4/3) loam; weak fine granular structure; friable; 7 percent coarse fragments; slight effervescence; mildly alkaline; clear smooth boundary.

C2—20 to 30 inches; brown (10YR 4/3) fine sandy loam; weak coarse subangular blocky structure; friable; 8 percent coarse fragments; slight effervescence; mildly alkaline; gradual smooth boundary.

C3—30 to 50 inches; brown (10YR 4/3) loamy sand; weak coarse subangular blocky structure; very friable; 10 percent coarse fragments; strong effervescence; moderately alkaline; gradual smooth boundary.

C4—50 to 72 inches; brown (10YR 5/3) sandy loam; massive; very friable; 10 percent coarse fragments; strong effervescence; moderately alkaline.

Reaction within the textural control section is mildly alkaline or moderately alkaline.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The C horizon has colors similar to those of the Ap horizon. It is stratified loam, fine sandy loam, sandy loam, silt loam, or loamy sand and gravelly analogs. The content of coarse fragments in the 10- to 40-inch textural control section ranges from 0 to 20 percent.

Switzerland series

The Switzerland series consists of deep, well drained soils that formed in loess, Kansan glacial till, and the underlying residuum of interbedded calcareous shale and limestone. These soils are on ridgetops and hillsides on uplands. Permeability is moderate in the upper part of the solum and very slow in the lower part. Slope ranges from 3 to 25 percent.

Switzerland soils are commonly adjacent to Ava, Cincinnati, Eden, and Rossmoyne soils and are similar to Eden and Pate soils. Ava, Cincinnati, and Rossmoyne soils have a fragipan, and Eden soils have bedrock at a depth of 20 to 40 inches. Pate soils do not have a loess mantle and are in colluvial positions on the lower part of hillsides.

Typical pedon of Switzerland silt loam, 15 to 25 percent slopes, eroded, about 2 miles northwest of Miamitown, in Whitewater Township, about 1,800 feet

west and 200 feet south of the northeast corner of sec. 35, T. 2 N., R. 1 E.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; very strongly acid; abrupt smooth boundary.

B1—6 to 12 inches; brown (7.5YR 5/4) silt loam; weak medium granular structure; friable; very strongly acid; clear smooth boundary.

B21t—12 to 18 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin patchy brown (7.5YR 5/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

B22t—18 to 24 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; thin patchy brown (7.5YR 5/4) and light brown (7.5YR 6/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

IIB23t—24 to 32 inches; yellowish brown (10YR 5/4) clay; common fine distinct brown (10YR 4/3) mottles; weak coarse subangular blocky structure; firm; thin patchy brown (10YR 4/3) clay films on faces of peds; 1 percent coarse fragments of chert and vein quartz; very strongly acid; clear smooth boundary.

IIB24—32 to 38 inches; yellowish brown (10YR 5/6) clay; many fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; 1 percent coarse fragments of chert and vein quartz; common very dark brown (10YR 2/2) concretions (iron and manganese oxides); strongly acid; clear wavy boundary.

IIB31—38 to 46 inches; olive brown (2.5Y 4/4) silty clay; common fine distinct light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure; firm; 1 percent coarse fragments of chert and vein quartz; many very dark brown (10YR 2/2) concretions (iron and manganese oxides); slightly acid; clear wavy boundary.

IIB32—46 to 53 inches; light olive brown (2.5Y 5/4) silty clay; weak coarse subangular blocky structure; very firm; common very dark brown (10YR 2/2) segregations and pockets of grayish brown (2.5Y 5/2) material; slightly acid; clear wavy boundary.

IIC1—53 to 64 inches; light olive brown (2.5Y 5/4) silty clay; massive; very firm; few large limestone flagstones oriented downslope; light reddish brown (5YR 6/4) and grayish brown (10YR 5/2) small seams and pockets; neutral; gradual wavy boundary.

IIC2—64 to 99 inches; light olive brown (2.5Y 5/4) silty clay; massive; very firm; few large limestone flagstones oriented downslope; strong effervescence; moderately alkaline.

The solum is 50 to 70 inches thick. The loess mantle is 20 to 36 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is silt loam or silty clay loam and ranges from medium acid to very strongly acid.

The IIB horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 8. It is clay or silty clay. It is medium acid to very strongly acid in the upper part and slightly acid to moderately alkaline in the lower part.

The C horizon has hue of 10YR to 5Y, value of 5 to 7, and chroma of 3 to 6. It is clay, silty clay, or flaggy clay. It is slightly acid to moderately alkaline.

Some pedons have a Cr horizon of interbedded clay shale and thin layers of limestone directly under the solum.

Wakeland series

The Wakeland series consists of deep, somewhat poorly drained soils that formed in recent alluvium on flood plains. Permeability is moderate. Slope is 0 to 2 percent.

Wakeland soils are commonly adjacent to the well drained Genesee soils. Genesee soils, which are on higher positions on the flood plain, do not have gray colors immediately under the A horizon.

Typical pedon of Wakeland silt loam, occasionally flooded, in the city of Cincinnati, about 850 feet west and 2,500 feet south of the northeast corner of sec. 6, F. R. 2, T. 3.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

C1—8 to 14 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

C2—14 to 29 inches; brown (10YR 5/3) silt loam; common medium faint grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

C3g—29 to 38 inches; grayish brown (10YR 5/2) silt loam; many coarse distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak medium subangular blocky structure; firm; slightly acid; clear wavy boundary.

C4—38 to 50 inches; brown (10YR 5/3) silt loam; many coarse faint grayish brown (10YR 5/2) and many coarse distinct yellowish brown (10YR 5/6) mottles; massive; firm; slightly acid; gradual wavy boundary.

C5g—50 to 60 inches; grayish brown (2.5Y 5/2) stratified silt loam and loam; common medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; massive; friable; slightly acid.

The soil is slightly acid or neutral above a depth of 40 inches and is slightly acid to moderately alkaline in the C horizon from 40 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is dominantly silt loam but is loam in some pedons.

The C horizon ranges from loam to light silty clay loam but is commonly silt loam. Many pedons have thin strata of sandy loam, silty clay loam, or clay loam in the lower part.

Warsaw Variant

The Warsaw Variant consists of well drained soils that formed in loamy outwash that is underlain by calcareous sand and gravel at a depth of 24 to 40 inches. These soils are on terraces and outwash plains. Permeability is moderate in the solum and very rapid in the substratum. Slope is 0 to 2 percent.

Warsaw Variant soils are similar to Fox soils and are commonly adjacent to Eldean and Martinsville soils. Eldean, Fox, and Martinsville soils have an ochric epipedon and have less clay in the subsoil. Martinsville soils also have a thicker solum.

Typical pedon of Warsaw Variant sandy loam, 0 to 2 percent slopes, about 2 miles southeast of Harrison, in Whitewater Township, about 1,888 feet east and 2,550 feet south of the northwest corner of sec. 4, T. 1 N., R. 1 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) sandy loam, dark brown (10YR 3/3) dry; weak fine granular structure; very friable; common fine roots; slightly acid; clear smooth boundary.

A12—7 to 14 inches; dark brown (7.5YR 3/2) sandy loam, dark brown (10YR 3/3) dry; weak medium subangular blocky structure parting to weak fine granular; friable; many fine roots; slightly acid; clear smooth boundary.

B21t—14 to 22 inches; dark brown (7.5YR 3/2) sandy loam, dark brown (10YR 3/3) dry; moderate coarse subangular blocky structure; friable; few roots; thin patchy dark brown (7.5YR 3/2) clay films on vertical faces of peds; 1 percent coarse fragments; medium acid; clear smooth boundary.

B22t—22 to 27 inches; dark brown (7.5YR 3/2) gravelly sandy loam, dark brown (10YR 3/3) dry; few fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles and few fine prominent gray (10YR 6/1) mottles; moderate medium subangular blocky structure; friable; thin patchy dark brown (7.5YR 3/2) clay films on faces of peds; 25 percent coarse fragments; medium acid; abrupt smooth boundary.

B23t—27 to 31 inches; dark brown (10YR 3/3) gravelly sandy loam, dark yellowish brown (10YR 4/4) dry; weak fine subangular blocky structure; friable; thin patchy dark brown (7.5YR 3/2) clay films on faces of peds and in pores; 35 percent coarse fragments; neutral; abrupt smooth boundary.

C—31 to 60 inches; yellowish brown (10YR 5/4) very gravelly loamy coarse sand; single grain; loose; 50 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 24 to 40 inches.

The Ap or A1 horizon has hue of 10YR or 7.5YR and value and chroma of 2 or 3. It is dominantly sandy loam but is loam in some pedons.

The Bt horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 2 to 4. It is sandy loam or loam and gravelly analogs.

Wea series

The Wea series consists of deep, well drained soils that formed in a thin layer of loess over loamy or sandy outwash material on stream terraces and outwash plains. Permeability is moderate in the subsoil and very rapid in the substratum. Slope is 0 to 2 percent.

Wea soils are commonly adjacent to Eldean and Martinsville soils. Eldean and Martinsville soils have an ochric epipedon. Eldean soils have more clay in the subsoil than Wea soils.

Typical pedon of Wea silt loam, 0 to 2 percent slopes, about 1.5 miles northeast of New Haven; in Crosby Township, about 1,600 feet west and 1,500 feet north of the southeast corner of sec. 2, T. 2 N., R. 1 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 4/3) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

A12—10 to 15 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 4/3) dry; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

B21t—15 to 23 inches; brown (10YR 4/3) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (10YR 3/3) organic coats and clay films on faces of peds; slightly acid; clear smooth boundary.

IIB22t—23 to 30 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous brown (10YR 4/3) clay films on faces of peds; slightly acid; clear wavy boundary.

IIB23t—30 to 38 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; firm; thin patchy brown (10YR 4/3) clay films on faces of peds; slightly acid; clear wavy boundary.

IIB3—38 to 59 inches; brown (10YR 4/3) sandy loam; weak coarse subangular blocky structure; friable; neutral; gradual wavy boundary.

IIC—59 to 70 inches; brown (10YR 5/3) very gravelly loamy sand; single grain; loose; 60 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 40 to 70 inches.

The Ap or A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 2.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam.

The IIB horizon has colors similar to those in the B horizon. It is sandy clay loam, clay loam, sandy loam, or loam.

The IIC horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. It is very gravelly loamy sand to gravelly sand.

Whitaker series

The Whitaker series consists of deep, somewhat poorly drained soils that formed in stratified loamy sediments on outwash and lacustrine terraces. Permeability is moderate. Slope is 0 to 2 percent.

Whitaker soils are similar to Henshaw soils and are commonly adjacent to Eldean, Martinsville, and Princeton soils. Eldean, Martinsville, and Princeton soils are well drained and do not have gray colors in the subsoil. Eldean soils also have more clay in the subsoil. Henshaw soils have more silt and less sand in the subsoil.

Typical pedon of Whitaker loam, 0 to 2 percent slopes, about 1.5 miles west of New Haven, in Harrison Township, about 300 feet west and 800 feet south of the northeast corner of sec. 16, T. 2 N., R. 1 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

B1t—9 to 15 inches; brown (10YR 4/3) clay loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; few dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

B21tg—15 to 25 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear wavy boundary.

B22tg—25 to 29 inches; gray (10YR 5/1) clay loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; dark grayish brown (10YR 4/2) clay films on faces of peds and lining small pores; medium acid; clear wavy boundary.

B23tg—29 to 33 inches; gray (10YR 5/1) sandy clay loam; common medium distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium and coarse subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on vertical faces on peds; medium acid; gradual wavy boundary.

B24tg—33 to 38 inches; dark grayish brown (10YR 4/2) sandy clay loam; common fine distinct yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on some vertical faces of peds; medium acid; gradual wavy boundary.

B3t—38 to 45 inches; yellowish brown (10YR 5/4) sandy clay loam; few fine distinct grayish brown (10YR 5/2) and few fine faint yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; neutral; abrupt wavy boundary.

IIC—45 to 60 inches; brown (10YR 5/3) silt loam; many coarse faint grayish brown (10YR 5/2) and many coarse distinct yellowish brown (10YR 5/8) mottles; massive; firm; slight effervescence; mildly alkaline.

Solum thickness ranges from 40 to 50 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. It is clay loam, loam, or sandy clay loam.

The C horizon has colors similar to those in the B horizon. It is silt loam or silty clay loam.

Xenia series

The Xenia series consists of deep, moderately well drained, moderately slowly permeable soils on till plains. These soils formed in a mantle of loess and in the underlying calcareous Wisconsinan glacial till. Slope ranges from 0 to 6 percent.

Xenia soils are similar to Dana and Russell soils and are commonly adjacent to Dana, Fincastle, and Russell soils. Dana soils have a mollic epipedon. Fincastle soils are somewhat poorly drained and have more gray colors in the subsoil. Russell soils are well drained and do not have mottles in the upper part of the subsoil.

Typical pedon of Xenia silt loam, 2 to 6 percent slopes, eroded, in the city of Forest Park, in Springfield Township, about 500 feet west and 1,000 feet south of the northeast corner of sec. 25, R. 2, T. 2.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

B21t—9 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint yellowish brown (10YR 5/6) and few fine faint brown (10YR 5/3) mottles; moderate medium subangular blocky structure; friable; thin patchy dark yellowish brown (10YR 3/4) clay films on vertical faces of peds; common small root channels with brown (10YR 4/3) linings; medium acid; clear wavy boundary.

B22t—17 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin continuous brown (10YR 4/3) clay films on vertical and horizontal faces of peds; common very dark brown (10YR 2/2) concretions (iron and manganese oxides); medium acid; clear wavy boundary.

IIB23t—26 to 33 inches; yellowish brown (10YR 5/4) clay loam; common medium faint yellowish brown (10YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; moderate medium and coarse subangular blocky structure; firm; thin patchy brown (10YR 4/3) clay films on vertical faces of peds; few very dark brown (10YR 2/2) concretions and stains (iron and manganese oxides); few coarse fragments; medium acid; clear wavy boundary.

IIB3t—33 to 46 inches; yellowish brown (10YR 5/4) clay loam; common medium faint yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; weak medium and coarse subangular blocky structure; firm; thin patchy grayish brown (10YR 5/2) clay films on vertical faces of peds; few coarse fragments; neutral on ped surfaces; slight effervescence within peds; mildly alkaline; clear irregular boundary.

IIC1—46 to 54 inches; light olive brown (2.5Y 5/4) loam; many medium distinct gray (10YR 5/1) and grayish brown (10YR 5/2) mottles; massive; friable; few coarse fragments; strong effervescence; moderately alkaline; diffuse irregular boundary.

IIC2—54 to 62 inches; light olive brown (2.5Y 5/4) loam; common medium distinct gray (10YR 5/1) and grayish brown (10YR 5/2) mottles; massive; friable; 5 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 36 to 54 inches. Depth to carbonates ranges from 30 to 40 inches. Thickness of the loess mantle ranges from 22 to 35 inches.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4.

The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

The IIB horizon has colors similar to those in the B2 horizon.

The C horizon is loam or light clay loam glacial till.

Formation of the soils

This section describes the major factors of soil formation, tells how these factors have affected the soils of Hamilton County, and explains some of the processes of soil formation.

Factors of soil formation

The important factors in soil formation are parent material, climate, living organisms, topography, and time.

Climate and living organisms, particularly vegetation, are the active factors in soil formation. Their effect on the parent material is modified by topography and by the length of time the parent material has been acted upon. The relative importance of each factor differs from place to place. In some places, one factor dominates and is responsible for most of the soil properties, but normally, the interaction of all five factors determines the kind of soil that forms in any given place.

Parent material

Most of the soils in Hamilton County formed in glacial materials of Wisconsinan, Illinoian, or Kansan age. These materials consist of glacial drift, loess, and silty and clayey lacustrine material. These materials cover the interbedded shale and limestone bedrock. Some of the soils also formed in residuum of shale and limestone, and others formed in alluvium (*5*).

Glacial drift, a general term applied to till and glacial outwash, is the most extensive of the parent materials in the county. Glaciers generally transport debris only for short distances; therefore, the soils for the most part have formed in glacial drift derived from the underlying limestone and shale bedrock.

The source of the glacial till in the county is mainly within the county or in counties immediately to the north or northeast. Only about 10 to 15 percent of the rock fragments in the glacial till are from igneous rocks that have their source in either Canada or the northeastern part of the United States.

The Kansan glacial till is the oldest in the county. The soils that formed in this material are the most deeply leached. The Ava soils formed in this material and a 30- to 45-inch-thick mantle of Peoria loess. Illinoian glacial till is intermediate in age between the Kansan and Wisconsinan tills. The Avonburg, Cincinnati, and Rossmoyne soils formed in Illinoian glacial till. They are not as deeply leached as the soils that formed in Kansan till, and they have an 18- to 48-inch-thick loess mantle. Wisconsinan glacial till is the youngest in the county, and the soils that formed in this till have a thinner solum than those formed in Kansan or Illinoian till. The Fincastle, Miamian, Russell, and Xenia soils formed in Wisconsinan glacial till blanketed with a loess mantle less than 40 inches thick. Fincastle, Russell, and Xenia soils have a thicker loess mantle and are deeper to carbonates than the Miamian soils.

Deposits of outwash sand and gravel were laid down by glacial melt water that flowed in the glacial outwash streams, especially the Great Miami and Little Miami Rivers and their tributaries. This coarse material was fairly well sorted by the water. Much of it was then covered by finer textured material, mostly loamy outwash, which became the parent material of soils such as the Martinsville, Warsaw Variant, Wea, and Whitaker soils. Casco, Eldean, and Fox soils formed in the areas of water sorted sand and gravel where little of the loamy outwash material was originally deposited or where it has been removed by geologic erosion. These soils are relatively droughty, and most of them have a gravelly subhorizon in the lower part of the solum and sand and gravel in the substratum.

Residuum of clay shale and limestone bedrock has markedly influenced some of the soils. The lower horizons of Pate and Switzerland soils formed in parent material that was mostly residuum of the bedrock. The lower part of these soils has the color of the weathered bedrock. Olive brown and olive gray predominate in the layers that weathered from Ordovician Shale and Limestone. Eden soils have formed entirely in the residuum of the Ordovician Shale and Limestone bedrock.

Lacustrine material (lake-bottom sediment) is of considerable extent in the county. Lacustrine deposits of thinly layered or stratified silts and clays are the parent material of the Henshaw, Markland, and Patton soils.

Alluvium, the sediment left by floodwater, is the youngest parent material of soils in the county. It accumulates whenever a stream overflows. The sediment is derived mainly from the surface layer and subsoil of soils on higher lying terraces and uplands. The soils that formed in recent alluvium have little or no profile development. Genesee, Jules, and Stonelick soils are examples of soils on flood plains.

Climate

Climate affects the development of soils in several ways in Hamilton County. Rainfall and temperature have favored plant growth, and several soils have a surface layer that contains significant amounts of organic matter. The surface layer of the poorly drained Patton soils is dark colored because it contains a large amount of organic matter as a result of a local wet microclimate. Most of the parent material in the county is weathered fairly deep. Weathering is shallow in soils that have strong slope and a high calcium carbonate equivalent. Frequent rain and snow have supplied ample moisture for weathering in Miamian, Russell, and other soils, and water has leached soluble carbonates. The water from frequent rains has moved the clay from the surface layer to the subsoil. Evidence of such movement is shown in the clay films in the subsoil of Eldean, Fincastle, and Cincinnati soils. In this county, the structure of most soils is at least partly the result of freezing and thawing.

Living organisms

In addition to climate, organisms—plants, animals, insects, and man—are active factors of soil formation. Hardwood trees have been the dominant native vegetation in Hamilton County. The Cincinnati, Rossmoyne, Switzerland, and most other soils on uplands have a light colored surface layer and are acid because they formed under hardwood trees. The Dana and Warsaw Variant soils have a dark colored surface layer. They formed in small areas under mixed prairie vegetation and trees. The Raub and Patton soils also have a dark colored surface layer. They formed in marshy swales and flats, where excessive water has slowed the oxidation of organic matter.

By channeling to considerable depths, the insects, worms, and small animals make the soils more permeable. Worms, ants, and other insects mix the soil material considerably. Crayfish mix much of the material in such soils as Patton and Avonburg. In many places, crayfish tubes extend to a depth of 4 or 5 feet.

Man also influences soils. Construction work and soil tillage drastically alter the surface layer and subsoil. When man drains, irrigates, and fertilizes the soils, the natural chemical and climatic soil regime is greatly affected. Man's activity also causes accelerated erosion.

Topography

Some differences in the soils of this county are caused by differences in relief or topography. The Cincinnati, Rossmoyne, and Avonburg soils formed under similar conditions, except for natural drainage, which largely depends on topography. The gently sloping and strongly sloping Cincinnati soils have good surface drainage. Rossmoyne soils are nearly level to strongly sloping and are moderately well drained. They occupy slopes and convex positions where the water table is high for relatively short but significant periods. The Avonburg soils are somewhat poorly drained. They are nearly level and generally occur on slight rises. On these rises, surface runoff is mostly slow and the water table is seasonally high for long periods.

Because of the differences in drainage, there are other differences in the soils. For example, mottles are nearer the surface in the Avonburg soils than in Cincinnati or Rossmoyne soils. The Avonburg soils have a grayer subsoil than Cincinnati or Rossmoyne soils because they have been saturated for longer periods.

The poorly drained soils in this county are nearly level or depressional. They occur where surface runoff is slow to ponded and where silty and clayey materials tend to accumulate. The poorly drained Patton soils have a thick, dark-colored surface layer because organic matter decomposes slowly in wet soils.

Sloping soils in a given series commonly have a thinner solum than less sloping soils in the same series. For example, Eden silty clay loam, 15 to 25 percent slopes, has thinner horizons and a thinner solum (A and B horizons) than Eden silty clay loam, 8 to 15 percent slopes, eroded. The Hennepin soils have a thinner solum than less steep soils, partly because erosion removes soil material from steeper soils faster than from less steep soils.

Time

Important in soil development is the time that parent material has been in place and exposed to the active factors of climate and vegetation. In Hamilton County, glacial materials of Kansan age have been exposed for about 750,000 to 1,000,000 years. Glacial materials of Illinoian age are younger, about 100,000 to 300,000 years old. Glacial materials of Wisconsinan age are much younger, being only about 15,000 to 25,000 years old. Time has permitted the soils that formed in Kansan material to be leached to a greater depth than the soils that formed in Illinoian age materials. Soils that formed in Illinoian age material are leached to a greater depth than the soils formed in Wisconsinan age materials. The depth to carbonates ranges roughly from 2 to 4 feet in the Miamian, Eldean, and similar soils that formed in Wisconsinan glacial till or outwash; it ranges from about 4 to 10 feet or more in the Cincinnati, Rossmoyne, and similar soils that formed in Illinoian till or outwash. Rocks and minerals in Illinoian till are more weathered than those in Wisconsinan till.

Genesee, Jules, Stonelick, and other soils on bottom lands formed in recently deposited material. They receive additional material during flooding. In these soils, profile development is interrupted by the next layer of sediment deposited during flooding. These soils have a variable content of organic matter with depth.

Processes of soil formation

The soil-forming processes of addition, loss, transfer, and alteration of soil material and its components are controlled or influenced by the factors of soil formation discussed in the foregoing section. Some of these processes promote differences in a soil; others retard or prevent differences.

In Hamilton County the most evident soil-forming process is the addition of organic matter to the surface layer. Soils that formed under deep-rooted grasses or where a high water table has restricted decomposition of organic matter have a deep, dark-colored surface layer as in the Raub or Wea soils. These soils have a high content of organic matter, good structure, and a base saturation of more than 60 percent at 50 inches below the top of the argillic horizon. Some organic matter accumulates as a thin surface mat on most of the light colored soils. This organic matter is generally mixed with other soil material by cultivation, however, and evidence of the dark layer is obliterated.

Bases are also added to the soils by the organic matter and by seepage water, by depositions of eroded material, and by additions of lime and fertilizer. Plant nutrients move in a cycle from soil to plants and then back to soil again in the form of litter or other organic material. The Patton soils are seasonally waterlogged and continually accumulate bases through additions from seepage water. In these soils additions of bases are commonly greater than losses. Floodwaters periodically supply additions of alluvium to Genesee, Ross, Stonelick, and Lanier soils. When lime and fertilizer are added to cultivated soils, the added plant nutrients replace, or even exceed, the amount normally removed when crops are harvested.

Bases are removed by leaching and soil material is lost through erosion from some soils. Among the most significant losses in Hamilton County are losses through leaching of carbonates. Other minerals in the soil break down and are lost by leaching, but at a slower rate than the carbonates. After carbonates are leached, alteration of minerals, such as biotite and feldspars, produces changes of color within the profile. Free iron oxides are produced when some minerals are altered in Princeton, Eldean, and similar soils, giving fairly bright reddish or brownish colors. The seasonal high water table in Patton and Raub soils reduces iron, resulting in gray colors in the soils. If ground water is not within the profile, brownish colors of stronger chroma or redder hue than those of the C horizon develop.

Water is the carrier for most of the transfers in soils in the county. In many of the soils, clay has been transferred from the A horizon to the B horizon. Thus, the Bt horizon, especially the B2t horizon, is a zone of illuviation, or gain. The gain in clay accounts for the nearly continuous clay films on faces of peds in the B horizon of the Russell and Martinsville soils.

Transformations of mineral compounds occur in most soils. The results are most apparent if the development of horizons is not affected by rapid erosion or by accumulation of material on the surface. The primary silicate minerals are weathered chemically to produce secondary minerals, mainly those of the layer-lattice silicate clays. Most of the layer-lattice clays remain in the soil profile, but clay from the A horizon is transferred to deeper horizons.

The soils that make up most of the acreage in Hamilton County have rather strongly developed profiles. The processes of soil formation have produced distinct changes in the parent material. These well developed soils are nearly level to very steep, and they formed in deposits of glacial till and in glacial outwash on terraces in the major valleys. In a small part of the county, parent materials have been only slightly modified by the processes of soil formation. Some of these soils are on flood plains and some are steep soils on uplands.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Curtain drain. Artificial drain placed around the perimeter of a septic tank absorption field to lower the water table; also called *perimeter drain.*

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly

drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A horizon. Includes all subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water bar. A shallow trench and a mound of earth constructed at an angle across a road or trail to intercept and divert surface runoff and control erosion.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[The data for Cinninnati were recorded in the period 1951-78, and the data for Fernbank were recorded in the period 1956-74]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
CINCINNATI											
January----	39.6	21.7	30.6	68	-8	19	3.08	1.79	4.22	7	5.8
February---	42.9	24.3	33.7	72	-3	9	2.48	.89	3.80	6	3.9
March------	53.3	33.5	43.4	81	13	68	4.18	2.11	5.97	8	3.5
April------	66.4	43.2	54.8	86	25	164	3.59	1.85	5.11	7	.2
May--------	75.8	52.6	64.2	92	33	446	3.85	1.88	5.55	8	.0
June-------	83.9	61.4	72.7	96	46	681	3.71	2.37	4.92	7	.0
July-------	86.8	65.3	76.1	97	51	809	4.11	2.18	5.79	7	.0
August-----	85.6	63.4	74.5	97	48	760	3.27	1.99	4.40	6	.0
September--	79.6	56.8	68.2	94	37	546	3.07	1.30	4.57	6	.0
October----	68.3	44.4	56.4	87	25	229	2.38	.99	3.56	5	.0
November---	54.4	35.3	44.9	79	15	32	3.20	1.72	4.49	6	.9
December---	43.5	26.4	35.0	70	1	14	3.15	1.55	4.53	7	2.1
Year-----	65.0	44.0	54.5	99	-9	3,777	40.07	35.17	44.34	80	16.4

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average daily	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days[1]	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
FERNBANK											
January----	38.4	20.4	29.5	68	-8	0	2.96	1.55	4.19	6	4.0
February---	41.1	22.5	31.8	68	-2	0	2.48	1.00	3.71	6	5.2
March------	51.2	31.6	41.4	79	11	48	3.85	1.69	5.68	8	4.8
April------	64.8	42.4	53.7	85	23	137	3.84	1.67	5.69	8	.0
May--------	74.0	50.9	62.5	90	31	401	3.85	1.96	5.49	7	.0
June-------	81.9	59.9	70.9	94	46	627	3.41	2.01	4.65	7	.0
July-------	84.8	63.8	69.7	95	49	948	4.20	2.96	5.34	8	.0
August-----	84.5	62.2	73.4	96	49	725	3.13	1.76	4.34	5	.0
September--	78.7	56.8	67.8	92	39	534	3.02	1.27	4.49	6	.0
October----	68.3	45.1	56.7	87	27	239	2.23	.83	3.39	5	.0
November---	54.0	35.1	42.1	79	14	229	3.22	1.71	4.54	7	1.1
December---	43.1	26.7	34.9	70	1	23	2.93	1.46	4.19	6	2.1
Year-----	63.7	43.1	52.9	97	-8	3,911	39.12	33.81	44.74	79	17.2

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[The data for Cincinnati were recorded in the period 1951-78, and the data for Fernbank were recorded in the period 1956-74]

Probability	Temperature: 24° F or lower	Temperature: 28° F or lower	Temperature: 32° F or lower
	CINCINNATI		
Last freezing temperature in spring:			
1 year in 10 later than--	April 4	April 18	May 7
2 years in 10 later than--	March 29	April 13	May 2
5 years in 10 later than--	March 18	April 3	April 23
First freezing temperature in fall:			
1 year in 10 earlier than--	October 30	October 18	October 5
2 years in 10 earlier than--	November 5	October 23	October 10
5 years in 10 earlier than--	November 16	November 1	October 18
	FERNBANK		
Last freezing temperature in spring:			
1 year in 10 later than--	April 10	April 24	May 8
2 years in 10 later than--	April 4	April 19	May 3
5 years in 10 later than--	March 23	April 9	April 23
First freezing temperature in fall:			
1 year in 10 earlier than--	October 29	October 20	October 10
2 years in 10 earlier than--	November 4	October 24	October 15
5 years in 10 earlier than--	November 13	November 1	October 24

TABLE 3.--GROWING SEASON

[The data for Cincinnati were recorded in the period 1951-78, and the data for Fernbank were recorded in the period 1956-74]

Probability	Daily minimum temperature during growing season: Higher than 24° F	Higher than 28° F	Higher than 32° F
	CINCINNATI		
	Days	Days	Days
9 years in 10	218	188	157
8 years in 10	227	196	164
5 years in 10	243	211	178
2 years in 10	260	228	192
1 year in 10	271	238	199
	FERNBANK		
	Days	Days	Days
9 years in 10	212	187	161
8 years in 10	220	193	168
5 years in 10	235	206	183
2 years in 10	250	218	197
1 year in 10	258	224	204

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
ArA	Ava silt loam, 0 to 3 percent slopes	184	0.1
ArB2	Ava silt loam, 3 to 8 percent slopes, eroded	3,037	1.1
ArC2	Ava silt loam, 8 to 15 percent slopes, eroded	2,244	0.9
AsB	Ava-Urban land complex, 3 to 8 percent slopes	9,456	3.6
AsC	Ava-Urban land complex, 8 to 15 percent slopes	1,799	0.7
AvA	Avonburg silt loam, 0 to 2 percent slopes	1,567	0.6
AwA	Avonburg-Urban land complex, 0 to 2 percent slopes	1,618	0.6
BoD	Bonnell silt loam, 15 to 25 percent slopes	3,225	1.2
BoE	Bonnell silt loam, 25 to 35 percent slopes	4,156	1.6
BoF	Bonnell silt loam, 35 to 60 percent slopes	516	0.2
CcC2	Casco gravelly loam, 8 to 15 percent slopes, eroded	237	0.1
CdD	Casco loam, 15 to 25 percent slopes	386	0.2
CdE	Casco loam, 25 to 35 percent slopes	853	0.3
CdF	Casco loam, 35 to 70 percent slopes	364	0.1
CnB2	Cincinnati silt loam, 3 to 8 percent slopes, eroded	3,664	1.4
CnC2	Cincinnati silt loam, 8 to 15 percent slopes, eroded	6,205	2.3
DaB	Dana silt loam, 0 to 4 percent slopes	335	0.1
EcB2	Eden silty clay loam, 3 to 8 percent slopes, eroded	291	0.1
EcC2	Eden silty clay loam, 8 to 15 percent slopes, eroded	905	0.3
EcD	Eden silty clay loam, 15 to 25 percent slopes	12,215	4.6
EcE	Eden silty clay loam, 25 to 40 percent slopes	31,182	11.8
EdF	Eden flaggy silty clay loam, 40 to 60 percent slopes	9,511	3.6
EeB	Eden-Urban land complex, 3 to 8 percent slopes	577	0.2
EeC	Eden-Urban land complex, 8 to 15 percent slopes	922	0.4
EeD	Eden-Urban land complex, 15 to 25 percent slopes	3,952	1.5
EpA	Eldean loam, 0 to 2 percent slopes	1,933	0.7
EpB2	Eldean loam, 2 to 6 percent slopes, eroded	882	0.3
EpC2	Eldean loam, 6 to 12 percent slopes, eroded	223	0.1
ErA	Eldean-Urban land complex, 0 to 2 percent slopes	3,219	1.2
ErB	Eldean-Urban land complex, 2 to 6 percent slopes	1,218	0.5
FdA	Fincastle silt loam, 0 to 2 percent slopes	1,492	0.6
FeA	Fincastle-Urban land complex, 0 to 2 percent slopes	614	0.2
FoA	Fox loam, 0 to 2 percent slopes	541	0.2
FoB2	Fox loam, 2 to 6 percent slopes, eroded	360	0.1
FpA	Fox-Urban land complex, 0 to 3 percent slopes	744	0.3
Gn	Genesee loam, occasionally flooded	3,912	1.5
Go	Genesee-Urban land complex, occasionally flooded	1,888	0.7
HeF	Hennepin silt loam, 35 to 60 percent slopes	306	0.1
HoA	Henshaw silt loam, 0 to 2 percent slopes	694	0.3
Hu	Huntington silt loam, occasionally flooded	875	0.3
Ju	Jules silt loam, occasionally flooded	5,635	2.1
Lg	Lanier sandy loam, occasionally flooded	1,477	0.6
MaB	Markland silty clay loam, 2 to 6 percent slopes	629	0.2
MaC2	Markland silty clay loam, 6 to 12 percent slopes, eroded	281	0.1
MaD2	Markland silty clay loam, 12 to 18 percent slopes, eroded	157	0.1
MaE2	Markland silty clay loam, 18 to 25 percent slopes, eroded	292	0.1
McA	Martinsville silt loam, 0 to 2 percent slopes	2,073	0.8
McB	Martinsville silt loam, 2 to 6 percent slopes	616	0.2
MnC2	Miamian silt loam, 8 to 15 percent slopes, eroded	847	0.3
MoD2	Miamian-Hennepin silt loams, 15 to 25 percent slopes, eroded	420	0.2
MoE2	Miamian-Hennepin silt loams, 25 to 35 percent slopes, eroded	629	0.2
MuC	Miamian-Urban land complex, 8 to 15 percent slopes	857	0.3
PbB2	Parke silt loam, 3 to 8 percent slopes, eroded	575	0.2
PbC2	Parke silt loam, 8 to 15 percent slopes, eroded	914	0.3
PbD	Parke silt loam, 15 to 25 percent slopes	381	0.1
PbE	Parke silt loam, 25 to 35 percent slopes	381	0.1
PcB	Parke-Urban land complex, 3 to 8 percent slopes	519	0.2
PcC	Parke-Urban land complex, 8 to 15 percent slopes	320	0.1
PfC	Pate silty clay loam, 8 to 15 percent slopes	413	0.2
PfD	Pate silty clay loam, 15 to 25 percent slopes	3,338	1.3
PfE	Pate silty clay loam, 25 to 35 percent slopes	992	0.4
PhD	Pate-Urban land complex, 15 to 25 percent slopes	2,669	1.0
Pn	Patton silty clay loam	679	0.3
Po	Pits, gravel	2,771	1.0
PrA	Princeton sandy loam, 0 to 2 percent slopes	890	0.3
PrB	Princeton sandy loam, 2 to 6 percent slopes	490	0.2
PrC2	Princeton sandy loam, 6 to 12 percent slopes, eroded	520	0.2
RdA	Raub silt loam, 0 to 2 percent slopes	353	0.1
Rn	Ross loam, rarely flooded	763	0.3
RpA	Rossmoyne silt loam, 0 to 3 percent slopes	1,607	0.6
RpB2	Rossmoyne silt loam, 3 to 8 percent slopes, eroded	7,198	2.7
RpC2	Rossmoyne silt loam, 8 to 15 percent slopes, eroded	1,293	0.5

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
RtA	Rossmoyne-Urban land complex, 0 to 3 percent slopes	8,341	3.1
RtB	Rossmoyne-Urban land complex, 3 to 8 percent slopes	33,268	12.6
RtC	Rossmoyne-Urban land complex, 8 to 15 percent slopes	9,995	3.8
RwB2	Russell silt loam, 3 to 8 percent slopes, eroded	1,621	0.6
RxB	Russell-Urban land complex, 3 to 8 percent slopes	8,304	3.1
St	Stonelick fine sandy loam, frequently flooded	3,520	1.3
SwB2	Switzerland silt loam, 3 to 8 percent slopes, eroded	734	0.3
SwC2	Switzerland silt loam, 8 to 15 percent slopes, eroded	5,156	1.9
SwD2	Switzerland silt loam, 15 to 25 percent slopes, eroded	1,405	0.5
SxB	Switzerland-Urban land complex, 3 to 8 percent slopes	2,149	0.8
SxC	Switzerland-Urban land complex, 8 to 15 percent slopes	8,151	3.1
Ud	Udorthents, clayey	156	0.1
Uf	Udorthents, loamy	269	0.1
UgB	Urban land-Elkinsville complex, 3 to 8 percent slopes	1,117	0.4
UgC	Urban land-Elkinsville complex, 8 to 15 percent slopes	722	0.3
Uh	Urban land-Huntington complex, frequently flooded	4,627	1.8
UmB	Urban land-Martinsville complex, 3 to 8 percent slopes	5,253	2.0
UmC	Urban land-Martinsville complex, 8 to 15 percent slopes	431	0.2
Uo	Urban land-Patton complex	1,846	0.7
UrB	Urban land-Rossmoyne complex, 0 to 8 percent slopes	2,172	0.8
Ux	Urban land-Stonelick complex, frequently flooded	2,294	0.9
Wa	Wakeland silt loam, occasionally flooded	237	0.1
WbA	Warsaw Variant sandy loam, 0 to 2 percent slopes	281	0.1
WeA	Wea silt loam, 0 to 2 percent slopes	277	0.1
WhA	Whitaker loam, 0 to 2 percent slopes	125	*
XfA	Xenia silt loam, 0 to 2 percent slopes	639	0.2
XfB2	Xenia silt loam, 2 to 6 percent slopes, eroded	1,593	0.6
	Water	1,188	0.5
	Total	265,152	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Sweet corn	Strawberries
	N	N	N	N	I	I
	Bu	Bu	Bu	Ton	Lb	Lb
ArA: Ava	120	40	45	4.3	12,600	8,500
ArB2: Ava	100	35	40	4.3	9,000	7,000
ArC2: Ava	90	30	37	4.1	---	---
AsB: Ava-Urban land	---	---	---	---	---	---
AsC: Ava-Urban land	---	---	---	---	---	---
AvA: Avonburg	120	40	50	3.6	7,200	4,000
AwA: Avonburg-Urban land	---	---	---	---	---	---
BoD, BoE: Bonnell	---	---	---	---	---	---
BoF: Bonnell	---	---	---	---	---	---
CcC2: Casco	75	---	---	3.5	---	---
CdD: Casco	---	---	---	---	---	---
CdE, CdF: Casco	---	---	---	---	---	---
CnB2: Cincinnati	115	35	50	4.5	12,600	8,500
CnC2: Cincinnati	90	30	30	4.0	---	---
DaB: Dana	140	50	50	4.3	12,600	8,500
EcB2: Eden	100	35	45	3.0	9,000	7,500
EcC2: Eden	90	30	40	3.0	---	---
EcD: Eden	---	---	---	---	---	---
EcE, EdF: Eden	---	---	---	---	---	---
EeB: Eden-Urban land	---	---	---	---	---	---
EeC: Eden-Urban land	---	---	---	---	---	---
EeD: Eden-Urban land	---	---	---	---	---	---

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Sweet corn	Strawberries
	N	N	N	N	I	I
	Bu	Bu	Bu	Ton	Lb	Lb
EpA: Eldean	120	40	48	4.5	17,100	12,000
EpB2: Eldean	115	35	45	4.5	16,200	11,000
EpC2: Eldean	95	30	40	4.0	---	---
ErA: Eldean-Urban land	---	---	---	---	---	---
ErB: Eldean-Urban land	---	---	---	---	---	---
FdA: Fincastle	130	40	55	4.3	11,700	8,000
FeA: Fincastle-Urban land	---	---	---	---	---	---
FoA: Fox	110	35	41	4.5	17,100	12,000
FoB2: Fox	105	30	40	4.5	16,200	11,000
FpA: Fox-Urban land	---	---	---	---	---	---
Gn: Genesee	115	40	40	3.5	16,200	12,000
Go: Genesee-Urban land	---	---	---	---	---	---
HeF: Hennepin	---	---	---	1.2	---	---
HoA: Henshaw	110	45	45	4.0	---	---
Hu: Huntington	130	45	45	4.2	17,100	12,000
Ju: Jules	115	40	40	3.5	17,100	12,000
Lg: Lanier	105	30	40	3.5	16,200	11,000
MaB: Markland	110	35	40	2.6	12,600	10,000
MaC2: Markland	100	30	35	2.3	---	---
MaD2: Markland	---	---	25	1.8	---	---
MaE2: Markland	---	---	18	1.3	---	---
McA: Martinsville	120	40	45	4.0	16,200	12,000
McB: Martinsville	120	40	45	4.0	16,200	11,000

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Sweet corn	Strawberries
	N	N	N	N	I	I
	Bu	Bu	Bu	Ton	Lb	Lb
MnC2 Miamian	100	30	38	3.5	---	---
MoD2 Miamian-Hennepin	---	---	---	2.8	---	---
MoE2 Miamian-Hennepin	---	---	---	---	---	---
MuC Miamian-Urban land	---	---	---	---	---	---
PbB2 Parke	110	35	45	3.8	14,400	10,000
PbC2 Parke	100	30	38	3.0	---	---
PbD Parke	---	---	---	2.5	---	---
PbE Parke	---	---	---	---	---	---
PcB Parke-Urban land	---	---	---	---	---	---
PcC Parke-Urban land	---	---	---	---	---	---
PfC Pate	85	30	35	2.8	---	---
PfD Pate	---	---	24	1.8	---	---
PfE Pate	---	---	---	1.2	---	---
PhD Pate-Urban land	---	---	---	---	---	---
Pn Patton	130	40	50	5.6	---	---
Po*. Pits						
PrA Princeton	110	40	45	3.3	17,100	12,000
PrB Princeton	105	40	45	3.3	16,200	11,000
PrC2 Princeton	95	35	40	2.8	9,000	8,500
RdA Raub	140	50	60	4.6	---	---
Rn Ross	140	50	55	5.5	16,200	11,000
RpA Rossmoyne	110	40	45	4.5	12,600	10,000
RpB2 Rossmoyne	100	35	40	4.0	9,000	8,000

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Sweet corn	Strawberries
	N	N	N	N	I	I
	Bu	Bu	Bu	Ton	Lb	Lb
RpC2----------------------- Rossmoyne	90	30	40	3.5	---	---
RtA----------------------- Rossmoyne-Urban land	---	---	---	---	---	---
RtB----------------------- Rossmoyne-Urban land	---	---	---	---	---	---
RtC----------------------- Rossmoyne-Urban land	---	---	---	---	---	---
RwB2----------------------- Russell	125	40	50	3.8	12,600	8,500
RxB----------------------- Russell-Urban land	---	---	---	---	---	---
St----------------------- Stonelick	95	30	38	3.5	14,400	10,000
SwB2----------------------- Switzerland	100	35	40	3.0	12,600	8,500
SwC2----------------------- Switzerland	90	30	38	2.6	---	---
SwD2----------------------- Switzerland	---	---	25	1.8	---	---
SxB----------------------- Switzerland-Urban land	---	---	---	---	---	---
SxC----------------------- Switzerland-Urban land	---	---	---	---	---	---
Ud*, Uf*. Udorthents						
UgB----------------------- Urban land-Elkinsville	---	---	---	---	---	---
UgC----------------------- Urban land-Elkinsville	---	---	---	---	---	---
Uh----------------------- Urban land-Huntington	---	---	---	---	---	---
UmB----------------------- Urban land-Martinsville	---	---	---	---	---	---
UmC----------------------- Urban land-Martinsville	---	---	---	---	---	---
Uo----------------------- Urban land-Patton	---	---	---	---	---	---
UrB----------------------- Urban land-Rossmoyne	---	---	---	---	---	---
Ux----------------------- Urban land-Stonelick	---	---	---	---	---	---
Wa----------------------- Wakeland	110	40	45	4.4	9,000	6,000
WbA----------------------- Warsaw Variant	110	40	50	3.1	1,800	11,000

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Sweet corn	Strawberries
	N	N	N	N	I	I
	Bu	Bu	Bu	Ton	Lb	Lb
WeA----------------------- Wea	140	50	50	4.0	14,400	10,000
WhA----------------------- Whitaker	110	45	50	4.1	10,800	8,500
XfA----------------------- Xenia	130	45	55	4.0	14,400	10,000
XfB2---------------------- Xenia	125	40	48	3.8	13,500	10,000

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Data are only approximate because a large part of the county is in urban uses. Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	4,642	---	---	---
II	95,704	58,774	31,645	5,285
III	52,015	47,830	4,185	---
IV	6,765	6,765	---	---
V	---	---	---	---
VI	24,259	24,259	---	---
VII	44,353	44,353	---	---
VIII	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
ArA, ArB2, ArC2---- Ava	2o	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow-poplar------- Black walnut--------	75 80 90 ---	Eastern cottonwood, sweetgum, yellow-poplar, white oak, American sycamore.
AvA---------------- Avonburg	3d	Slight	Slight	Moderate	Moderate	White oak----------- Northern red oak---- Pin oak------------- Yellow-poplar------- Sweetgum-----------	70 75 85 85 80	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
BoD, BoE----------- Bonnell	2c	Moderate	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- Shortleaf pine------ Virginia pine-------	76 90 80 80	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine.
BoF---------------- Bonnell	2c	Severe	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- Shortleaf pine------ Virginia pine-------	76 90 80 80	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine.
CcC2--------------- Casco	3s	Slight	Slight	Moderate	Moderate	White oak----------- Red pine------------ Eastern white pine-- Jack pine-----------	70 78 85 68	Eastern white pine, red pine.
CdD---------------- Casco	3s	Moderate	Moderate	Moderate	Moderate	White oak----------- Red pine------------ Eastern white pine-- Jack pine-----------	70 78 85 68	Eastern white pine, red pine.
CdE, CdF----------- Casco	3s	Severe	Severe	Moderate	Moderate	White oak----------- Red pine------------ Eastern white pine-- Jack pine-----------	70 78 85 68	Eastern white pine, red pine.
CnB2, CnC2--------- Cincinnati	2d	Slight	Slight	Moderate	Moderate	Northern red oak---- White oak----------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash----------- Yellow-poplar-------	80 --- --- --- --- --- ---	Eastern white pine, yellow-poplar, white ash, red pine, northern red oak, white oak.
DaB---------------- Dana	---	--------	--------	--------	--------	-------------------	---	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
EcB2--------------- Eden	3c	Slight	Moderate	Moderate	Moderate	Eastern redcedar----	44	Virginia pine, Austrian pine.
EcC2, EcD, EcE----- Eden	3c	Moderate	Severe	Moderate	Moderate	Eastern redcedar----	44	Virginia pine, Austrian pine.
EdF---------------- Eden	3c	Severe	Severe	Moderate	Moderate	Eastern redcedar----	44	Virginia pine, Austrian pine.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
EpA, EpB2, EpC2 Eldean	2o	Slight	Slight	Slight	Slight	Northern red oak Black oak White oak Black walnut Black cherry Sugar maple White ash Yellow-poplar	80 80 80 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, white oak.
FdA Fincastle	3o	Slight	Slight	Slight	Slight	Northern red oak White oak Pin oak Yellow-poplar Sweetgum	75 75 85 85 80	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
FoA, FoB2 Fox	2o	Slight	Slight	Slight	Slight	Northern red oak White oak Sugar maple	80 --- ---	Yellow-poplar, white ash, eastern white pine, red pine.
Gn Genesee	1o	Slight	Slight	Slight	Slight	Yellow-poplar	100	Eastern white pine, black walnut, yellow-poplar.
HeF Hennepin	1r	Severe	Severe	Slight	Slight	Northern red oak White oak	85 ---	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine.
HoA Henshaw	2o	Slight	Slight	Slight	Slight	Pin oak Yellow-poplar Sweetgum	95 95 95	White ash, sweetgum, eastern cottonwood, yellow-poplar.
Hu Huntington	1o	Slight	Slight	Slight	Slight	Yellow-poplar Northern red oak	96 85	Yellow-poplar, black walnut, eastern white pine.
Ju Jules	---	---	---	---	---	---	---	Black walnut, American sycamore, eastern cottonwood, red maple, green ash, sweetgum, common hackberry.
Lg Lanier	2s	Slight	Slight	Slight	Slight	Northern red oak Black oak Red maple Bur oak Quaking aspen Green ash Slippery elm	80 80 --- --- --- --- ---	Eastern white pine, red pine, green ash.
MaB, MaC2, MaD2, MaE2 Markland	2c	Slight	Slight	Severe	Severe	White oak Northern red oak	75 78	Eastern white pine, red pine, yellow-poplar, white ash.
McA, McB Martinsville	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
MnC2 Miamian	1o	Slight	Slight	Slight	Slight	Northern red oak Black walnut White oak Yellow-poplar Black cherry Sugar maple White ash	87 --- --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
MoD2*:								
Miamian	1r	Moderate	Moderate	Slight	Slight	Northern red oak Black walnut White oak Yellow-poplar Black cherry Sugar maple White ash	87 --- --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
Hennepin	1r	Moderate	Moderate	Slight	Slight	Northern red oak White oak	86 ---	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine.
MoE2*:								
Miamian	1r	Moderate	Moderate	Slight	Slight	Northern red oak Black walnut White oak Yellow-poplar Black cherry Sugar maple White ash	87 --- --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
Hennepin	1r	Severe	Severe	Slight	Slight	Northern red oak White oak	86 ---	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine.
PbB2, PbC2 Parke	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
PbD, PbE Parke	1r	Moderate	Moderate	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
PfC Pate	1c	Slight	Slight	Severe	Severe	Northern red oak Yellow-poplar Virginia pine White oak Sweetgum	86 98 --- --- ---	Eastern white pine, yellow-poplar, black walnut, white ash, red pine.
PfD, PfE Pate	1c	Moderate	Moderate	Severe	Severe	Northern red oak Yellow-poplar Virginia pine White oak Sweetgum	86 98 --- --- ---	Eastern white pine, yellow-poplar, black walnut, white ash, red pine.
Pn Patton	2w	Slight	Severe	Moderate	Moderate	Pin oak White oak Sweetgum Northern red oak	85 75 80 75	Eastern white pine, red maple, white ash, sweetgum.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
PrA, PrB, PrC2----- Princeton	1o	Slight	Slight	Slight	Slight	White oak----------- Yellow-poplar------- Sweetgum------------	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash, black locust.
RdA---------------- Raub	---	--------	--------	--------	--------	-------------------	---	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
Rn----------------- Ross	1o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Sugar maple--------- White oak----------- Black walnut-------- Black cherry-------- White ash-----------	86 96 85 --- --- --- ---	Eastern white pine, black walnut, white ash, yellow-poplar.
RpA, RpB2, RpC2---- Rossmoyne	2d	Slight	Slight	Moderate	Moderate	Northern red oak---- White ash----------- White oak----------- Sugar maple--------- Slippery elm-------- American beech------ American sycamore---	80 --- --- --- --- --- ---	Green ash, Virginia pine, yellow-poplar, red pine.
RwB2--------------- Russell	1o	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow-poplar------- Sweetgum------------	90 90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
St----------------- Stonelick	2o	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash----------- Yellow-poplar-------	80 --- --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, white oak.
SwB2, SwC2--------- Switzerland	1o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Virginia pine------- Shortleaf pine------ White oak----------- Sweetgum------------	86 98 --- --- --- ---	Eastern white pine, yellow-poplar, black walnut, white ash, red pine.
SwD2--------------- Switzerland	1r	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Virginia pine------- Shortleaf pine------ White oak----------- Sweetgum------------	86 98 --- --- --- ---	Eastern white pine, yellow-poplar, black walnut, white ash, red pine.
Wa----------------- Wakeland	2o	Slight	Slight	Slight	Slight	Pin oak------------- Sweetgum------------ Yellow-poplar------- Virginia pine-------	90 88 90 85	Eastern white pine, American sycamore, red maple, white ash.
WbA---------------- Warsaw Variant	---	--------	--------	--------	--------	-------------------	---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, white oak.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
WeA*: Wea	---	---	---	---	---	---	---	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
WhA: Whitaker	3o	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Sweetgum Northern red oak	70 85 85 80 75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
XfA, XfB2: Xenia	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
ArA, ArB2, ArC2--- Ava	---	Washington hawthorn, Amur privet, eastern redcedar, Tatarian honeysuckle, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
AsB*, AsC*:					
Ava---------------	---	Washington hawthorn, Amur privet, eastern redcedar, Tatarian honeysuckle, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Urban land.					
AvA--------------- Avonburg	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
AwA*:					
Avonburg---------	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Urban land.					
BoD, BoE, BoF----- Bonnell	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
CcC2, CdD, CdE, CdF-------------- Casco	Siberian peashrub	Eastern redcedar, lilac, radiant crabapple, autumn-olive, Washington hawthorn, Tatarian honeysuckle.	Northern catalpa, osageorange, green ash, honeylocust, Russian-olive.	---	---
CnB2, CnC2-------- Cincinnati	---	Eastern redcedar, Washington hawthorn, Tatarian honeysuckle, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Austrian pine, osageorange.	Pin oak, eastern white pine.	---
DaB--------------- Dana	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
EcB2, EcC2, EcD, EcE, EdF--------- Eden	---	Eastern redcedar, Washington hawthorn, Tatarian honeysuckle, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Austrian pine, osageorange.	Pin oak, eastern white pine.	---
EeB*, EeC*, EeD*:					
Eden-------------	---	Eastern redcedar, Washington hawthorn, Tatarian honeysuckle, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Austrian pine, osageorange.	Pin oak, eastern white pine.	---
Urban land.					
EpA, EpB2, EpC2--- Eldean	Siberian peashrub	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, Amur honeysuckle, Amur privet, arrowwood, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
ErA*, ErB*:					
Eldean	Siberian peashrub	Autumn-olive, eastern redcedar, radiant crabapple, Tatarian honeysuckle, Washington hawthorn, Amur honeysuckle, lilac.	Austrian pine, eastern white pine, jack pine, red pine.	---	---
Urban land.					
FdA Fincastle	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
FeA*:					
Fincastle	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Urban land.					
FoA, FoB2 Fox	Siberian peashrub	Autumn-olive, Amur honeysuckle, eastern redcedar, radiant crabapple, Washington hawthorn, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
FpA*:					
Fox	Siberian peashrub	Autumn-olive, Amur honeysuckle, eastern redcedar, radiant crabapple, Washington hawthorn, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
Urban land.					
Gn Genesee	---	Amur honeysuckle, silky dogwood, American cranberrybush, Amur privet.	Northern white-cedar, Washington hawthorn, white fir, blue spruce, Austrian pine.	Norway spruce	Eastern white pine, pin oak.
Go*:					
Genesee	---	Amur honeysuckle, silky dogwood, American cranberrybush, Amur privet.	Northern white-cedar, Washington hawthorn, white fir, blue spruce, Austrian pine.	Norway spruce	Eastern white pine, pin oak.
Urban land.					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
HeF: Hennepin	Siberian peashrub, Tatarian honey-suckle.	Osageorange, Russian-olive, eastern redcedar, Washington hawthorn.	Honeylocust, northern catalpa.	---	---
HoA: Henshaw	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Hu: Huntington	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Ju: Jules	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow	---
Lg: Lanier	---	Tatarian honey-suckle, Siberian peashrub.	Green ash, osage-orange, eastern redcedar, northern white-cedar, white spruce, nanny-berry viburnum, Washington hawthorn.	Black willow	---
MaB, MaC2, MaD2, MaE2: Markland	---	---	---	---	---
McA, McB: Martinsville	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
MnC2: Miamian	---	American cranberrybush, Amur honeysuckle, Amur privet, silky dogwood.	Blue spruce, white fir, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
MoD2*, MoE2*:					
Miamian	---	American cranberrybush, Amur honeysuckle, Amur privet, silky dogwood.	Blue spruce, white fir, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Hennepin	Siberian peashrub, Tatarian honey-suckle.	Osageorange, Russian-olive, eastern redcedar, Washington hawthorn.	Honeylocust, northern catalpa.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
MuC*:					
Miamian	---	American cranberrybush, Amur honeysuckle, Amur privet, silky dogwood.	Blue spruce, white fir, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Urban land.					
PbB2, PbC2, PbD, PbE Parke	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
PcB*, PcC*:					
Parke	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
Urban land.					
PfC, PfD, PfE Pate	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
PhD*:					
Pate	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
Urban land.					
Pn Patton	---	Amur privet, silky dogwood, American cranberrybush, Amur honeysuckle.	White fir, northern white-cedar, blue spruce, Austrian pine, Washington hawthorn, Norway spruce.	Eastern white pine	Pin oak.
Po*. Pits					
PrA, PrB, PrC2 Princeton	---	Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Eastern redcedar, Austrian pine, osageorange, northern white-cedar.	Eastern white pine, Norway spruce, red pine.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
RdA: Raub	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Rn: Ross	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osage-orange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow	---
RpA, RpB2, RpC2: Rossmoyne	---	Washington hawthorn, Amur honeysuckle, Amur privet, Tatarian honeysuckle, eastern redcedar, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Pin oak, eastern white pine.	---
RtA*, RtB*, RtC*:					
Rossmoyne	---	Washington hawthorn, Amur honeysuckle, Amur privet, Tatarian honeysuckle, eastern redcedar, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Pin oak, eastern white pine.	---
Urban land.					
RwB2: Russell	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
RxB*:					
Russell	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Urban land.					
St: Stonelick	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, eastern redcedar, osageorange, northern white-cedar, nannyberry viburnum, white spruce, Washington hawthorn.	Black willow	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
SwB2, SwC2, SwD2-- Switzerland	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
SxB*, SxC*: Switzerland------	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
Urban land.					
Ud*, Uf*. Udorthents					
UgB*, UgC*: Urban land.					
Elkinsville------	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Uh*: Urban land.					
Huntington-------	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
UmB*, UmC*: Urban land.					
Martinsville-----	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Uo*: Urban land.					
Patton-----------	---	Amur privet, silky dogwood, American cranberrybush, Amur honeysuckle.	White fir, northern white-cedar, blue spruce, Austrian pine, Washington hawthorn, Norway spruce.	Eastern white pine	Pin oak.
UrB*: Urban land.					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
UrB*: Rossmoyne	---	Washington hawthorn, Amur honeysuckle, Amur privet, Tatarian honeysuckle, eastern redcedar, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Pin oak, eastern white pine.	---
Ux*: Urban land.					
Stonelick	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, eastern redcedar, osageorange, northern white-cedar, nannyberry viburnum, white spruce, Washington hawthorn.	Black willow	---
Wa: Wakeland	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush, silky dogwood.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	---	Eastern white pine, pin oak.
WbA: Warsaw Variant	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
WeA: Wea	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
WhA: Whitaker	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, Washington hawthorn, northern white-cedar.	Norway spruce	Eastern white pine, pin oak.
XfA, XfB2: Xenia	---	Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn, Amur privet.	Norway spruce	Eastern white pine, pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--LANDSCAPE PLANTS

[This is a partial list of plants that have been used effectively in recent years]

Soil name and map symbol	Vines and ground cover	Shrubs	Trees	Grasses and legumes
ArA, ArB2, ArC2: Ava	Winter creeper, plantain lily, Hall honeysuckle, phlox, forsythia, pachysandra.	Red chokecherry, European privet, redosier dogwood, inkberry, mockorange.	Eastern white pine, red pine, sweetgum, white oak, yellow-poplar.	Redtop, Kentucky bluegrass, tall fescue, crownvetch.
AsB, AsC*:				
Ava	Winter creeper, plantain lily, honeysuckle, phlox, forsythia, pachysandra.	Red chokecherry, European privet, redosier dogwood, inkberry, mockorange.	Eastern white pine, red pine, sweetgum, white oak, yellow-poplar.	Redtop, Kentucky bluegrass, tall fescue, crownvetch.
Urban land.				
AvA: Avonburg	Bugleweed, goutweed, plantain lily, yellow root, sweet woodruff, creeping speedwell.	Red chokecherry, Amur privet, redosier dogwood, nannyberry viburnum, inkberry, mockorange.	London plane tree, red maple, silver maple, sweetgum, swamp white oak.	Redtop, reed canarygrass, Kentucky bluegrass, tall fescue.
AwA*:				
Avonburg	Bugleweed, goutweed, plantain lily, yellow root, sweet woodruff, creeping speedwell.	Red chokecherry, Amur privet, redosier dogwood, nannyberry viburnum, inkberry, mockorange.	London plane tree, red maple, silver maple, sweetgum, swamp white oak.	Redtop, reed canarygrass, Kentucky bluegrass, tall fescue.
Urban land.				
BoD, BoE, BoF: Bonnell	Sweet woodruff, lilyofthevalley, English ivy, myrtle, pachysandra.	Leatherleaf viburnum, juniper, serviceberry.	Eastern white pine, red pine, white oak, yellow-poplar.	Red fescue, tall fescue, Kentucky bluegrass, crownvetch.
CcC2, CdD, CdE, CdF: Casco	Hall honeysuckle, juniper, plantain lily, yellow root.	Juniper, nannyberry viburnum.	Thornless honeylocust, American sycamore, white spruce, green ash, Washington hawthorn.	Red fescue, Kentucky bluegrass, crownvetch. tall fescue.
CnB2, CnC2: Cincinnati	Phlox, lilyofthevalley, pachysandra, plantain lily, winter creeper.	Forsythia, redosier dogwood, Japanese yew, arborvitae, Tatarian honeysuckle.	Red pine, sugar maple, thornless honeylocust, yellow-poplar, Norway maple, eastern white pine.	Crownvetch, red fescue, Kentucky bluegrass, tall fescue.
DaB: Dana	Phlox, lilyofthevalley, pachysandra, plantain lily, winter creeper.	Forsythia, redosier dogwood, Japanese yew, arborvitae, Tatarian honeysuckle.	Red pine, sugar maple, thornless honeylocust, yellow-poplar, Norway maple, eastern white pine.	Crownvetch, red fescue, Kentucky bluegrass, tall fescue.
EcB2, EcC2, EcD, EcE, EdF: Eden	Cotoneaster, English ivy, myrtle, winter creeper, juniper.	Amur privet, redosier dogwood, Japanese yew, Tatarian honeysuckle.	Eastern redcedar, Norway maple, thornless honeylocust, radiant crabapple, yellow-poplar, Scotch pine.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.

See footnote at end of table.

TABLE 9.--LANDSCAPE PLANTS--Continued

Soil name and map symbol	Vines and ground cover	Shrubs	Trees	Grasses and legumes
EeB, EeC, EeD*:				
Eden	Cotoneaster, English ivy, myrtle, winter creeper, juniper.	Amur privet, redosier dogwood, Japanese yew, Tatarian honeysuckle.	Eastern redcedar, Norway maple, thornless honeylocust, radiant crabapple, yellow-poplar, Scotch pine.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
Urban land.				
EpA, EpB2, EpC2 Eldean	Creeping speedwell, Hall honeysuckle, juniper, moss pink, plantain lily.	Leatherleaf viburnum, juniper, serviceberry.	Black walnut, eastern white pine, red pine, thornless honeylocust, white oak, yellow-poplar.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
ErA, ErB*:				
Eldean	Creeping speedwell, Hall honeysuckle, juniper, moss pink, plantain lily.	Leatherleaf viburnum, juniper, serviceberry.	Black walnut, eastern white pine, red pine, thornless honeylocust, yellow-poplar, white oak.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
Urban land.				
FdA Fincastle	Bugleweed, goutweed, lily turf, plantain lily, yellow root, sweet woodruff.	Arrowwood, bottlebrush buckeye, red chokecherry, Amur privet, redosier dogwood.	Sweetgum, yellow-poplar, white ash, red maple, swamp white oak, London plane tree.	Kentucky bluegrass, redtop, tall fescue.
FeA*:				
Fincastle	Bugleweed, goutweed, lily turf, plantain lily, yellow root, sweet woodruff.	Arrowwood, bottlebrush buckeye, red chokecherry, Amur privet, redosier dogwood.	Sweetgum, yellow-poplar, white ash, red maple, swamp white oak, London plane tree.	Kentucky bluegrass, redtop, tall fescue.
Urban land.				
FoA, FoB2 Fox	Creeping speedwell, Hall honeysuckle, juniper, moss pink, plantain lily.	Leatherleaf viburnum, juniper, serviceberry.	Eastern white pine, red pine, thornless honeylocust, white oak, yellow-poplar, white ash.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
FpA*:				
Fox	Creeping speedwell, Hall honeysuckle, juniper, moss pink, plantain lily.	Leatherleaf viburnum, juniper, serviceberry.	Eastern white pine, red pine, thornless honeylocust, white oak, yellow-poplar, white ash.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
Urban land.				
Gn Genesee	Lilyofthevalley, pachysandra, myrtle, plantain lily.	Bayberry, redosier dogwood, nannyberry viburnum, Amur privet.	Eastern cottonwood, locust, Norway maple.	Red fescue, Kentucky bluegrass, tall fescue.
Go*:				
Genesee	Lilyofthevalley, pachysandra, myrtle, plantain lily.	Bayberry, redosier dogwood, nannyberry viburnum, Amur privet.	Eastern cottonwood, locust.	Red fescue, Kentucky bluegrass, tall fescue.
Urban land.				

See footnote at end of table.

TABLE 9.--LANDSCAPE PLANTS--Continued

Soil name and map symbol	Vines and ground cover	Shrubs	Trees	Grasses and legumes
HeF: Hennepin	Plantain lily, juniper, Hall honeysuckle, creeping speedwell.	Juniper	Thornless honeylocust	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
HoA: Henshaw	Goutweed, bugleweed, European wild ginger, sweet woodruff, yellow root.	Arrowwood, red chokecherry, redosier dogwood, Amur privet.	Sweetgum, yellow-poplar, eastern cottonwood, red maple, silver maple, white ash.	Kentucky bluegrass, redtop, tall fescue.
Hu: Huntington	Forsythia, lilyofthevalley, myrtle, pachysandra, plantain lily.	Bayberry, dogwood, nannyberry viburnum, Amur privet.	Norway maple, thornless honeylocust, black walnut, yellow-poplar.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
Ju: Jules	Plantain lily, juniper, Hall honeysuckle.	Juniper, nannyberry viburnum.	Honeylocust, American sycamore, eastern cottonwood, Washington hawthorn.	Red fescue, Kentucky bluegrass, tall fescue.
Lg: Lanier	Hall honeysuckle, juniper, plantain lily.	Juniper, nannyberry viburnum.	Honeylocust, American sycamore, eastern cottonwood, Washington hawthorn.	Red fescue, Kentucky bluegrass, tall fescue.
MaB, MaC2, MaD2, MaE2: Markland	European wild ginger, sweet woodruff, lilyofthevalley, myrtle, creeping thyme.	Red chokecherry, Amur privet, redosier dogwood, mockorange.	Eastern white pine, red pine, white oak, yellow-poplar.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
McA, McB: Martinsville	Creeping thyme, Hall honeysuckle, juniper, moss pink, plantain lily.	Forsythia, leatherleaf viburnum, serviceberry, Japanese yew.	Eastern white pine, thornless honeylocust, red pine, white oak, yellow-poplar, black walnut.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
MnC2: Miamian	Forsythia, lilyofthevalley, myrtle, pachysandra, plantain lily.	Amur privet, redosier dogwood, Japanese yew, nannyberry viburnum.	Radiant crabapple, Norway maple, thornless honeylocust, yellow-poplar, eastern white pine.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
MoD2, MoE2*:				
Miamian	Forsythia, lilyofthevalley, myrtle, pachysandra, plantain lily.	Amur privet, redosier dogwood, Japanese yew, nannyberry viburnum.	Radiant crabapple, Norway maple, thornless honeylocust, yellow-poplar, eastern white pine.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
Hennepin	Plantain lily, juniper, Hall honeysuckle, creeping speedwell.	Juniper	Thornless honeysuckle	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
MuC*:				
Miamian	Forsythia, lilyofthevalley, myrtle, pachysandra, plantain lily.	Amur privet, redosier dogwood, Japanese yew, nannyberry viburnum.	Radiant crabapple, Norway maple, thornless honeylocust, yellow-poplar, eastern white pine.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.

See footnote at end of table.

TABLE 9.--LANDSCAPE PLANTS--Continued

Soil name and map symbol	Vines and ground cover	Shrubs	Trees	Grasses and legumes
MuC*: Urban land.				
PbB2, PbC2, PbD, PbE-- Parke	Creeping speedwell, Hall honeysuckle, juniper, moss pink, plantain lily, English ivy.	Forsythia, leather-leaf viburnum, serviceberry, Japanese yew.	Eastern white pine, thornless honey-locust, red pine, white oak, yellow-poplar, black walnut.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
PcB, PcC*: Parke	Creeping speedwell, Hall honeysuckle, juniper, moss pink, plantain lily, English ivy.	Forsythia, leather-leaf viburnum, serviceberry, Japanese yew.	Eastern white pine, thornless honey-locust, red pine, white oak, yellow-poplar, black walnut.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
Urban land.				
PfC, PfD, PfE Pate	Plantain lily, lily turf, yellow root, sweet woodruff, juniper.	Amur privet, redosier dogwood, Japanese yew.	Eastern white pine, Norway maple, radiant crabapple, thornless honey-locust, yellow-poplar.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
PhD*: Pate	Plantain lily, lily turf, yellow root, sweet woodruff, juniper.	Amur privet, redosier dogwood, Japanese yew.	Eastern white pine, Norway maple, radiant crabapple, thornless honey-locust, yellow-poplar.	Red fescue, Kentucky bluegrass, crownvetch, tall fescue.
Urban land.				
Pn Patton	Bugleweed, fern, plantain lily, yellow root, gout-weed, sweet woodruff.	Red chokecherry, Amur privet, inkberry, mockorange.	Red maple, silver maple, sweetgum, swamp white oak, white ash.	Redtop, reed canarygrass, tall fescue, Kentucky bluegrass.
PrA, PrB, PrC2 Princeton	Creeping speedwell, Hall honeysuckle, juniper, moss pink, plantain lily.	Forsythia, juniper, nannyberry viburnum, serviceberry.	Eastern white pine, red pine, white oak, yellow-poplar, black walnut.	Kentucky bluegrass, red fescue, crownvetch, tall fescue.
RdA Raub	Goutweed, bugleweed, plantain lily.	Arrowwood, red chokecherry, redosier dogwood.	Sweetgum, red maple, silver maple, poplar.	Redtop, tall fescue, Kentucky bluegrass.
Rn Ross	Juniper, plantain lily.	Juniper, nannyberry viburnum.	Honeylocust, black locust, Washington hawthorn, American sycamore.	Red fescue, Kentucky bluegrass, tall fescue.
RpA, RpB2, RpC2 Rossmoyne	Phlox, honeysuckle, lilyofthevalley, pachysandra, plantain lily, winter creeper.	Red chokecherry, Amur privet, mockorange, inkberry, redosier dogwood.	Eastern white pine, red maple, sweetgum, silver maple, yellow-poplar.	Redtop, Kentucky bluegrass, tall fescue, crownvetch.

See footnote at end of table.

TABLE 9.--LANDSCAPE PLANTS--Continued

Soil name and map symbol	Vines and ground cover	Shrubs	Trees	Grasses and legumes
RtA, RtB, RtC*:				
Rossmoyne	Phlox, honeysuckle, lilyofthevalley, pachysandra, plantain lily, winter creeper.	Red chokecherry, Amur privet, mockorange, inkberry, redosier dogwood.	Eastern white pine, red maple, sweetgum, silver maple, yellow-poplar.	Redtop, Kentucky bluegrass, tall fescue, crownvetch.
Urban land.				
RwB2 Russell	Creeping thyme, Hall honeysuckle, moss pink, plantain lily.	Forsythia, juniper, nannyberry viburnum, serviceberry.	Eastern white pine, red pine, white oak, yellow-poplar, black walnut.	Kentucky bluegrass, red fescue, crownvetch, tall fescue.
RxB*:				
Russell	Creeping thyme, Hall honeysuckle, juniper, moss pink, plantain lily.	Forsythia, juniper, nannyberry viburnum, serviceberry.	Eastern white pine, red pine, white oak, yellow-poplar, black walnut.	Kentucky bluegrass, red fescue, crownvetch, tall fescue.
Urban land.				
St Stonelick	Plantain lily, juniper, Hall honeysuckle.	Nannyberry viburnum, juniper.	White spruce, honeylocust, black walnut, Washington hawthorn, American sycamore.	Tall fescue, red fescue, Kentucky bluegrass.
SwB2, SwC2, SwD2 Switzerland	Phlox, lilyofthe-valley, lily turf, myrtle, plantain lily, forsythia.	Amur privet, redosier dogwood, Japanese yew, forsythia.	Norway maple, thornless honeylocust, eastern white pine, yellow-poplar, radiant crabapple.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
SxB, SxC*:				
Switzerland	Phlox, lilyofthe-valley, lily turf, myrtle, plantain lily, forsythia.	Amur privet, redosier dogwood, Japanese yew, forsythia.	Norway maple, thornless honeylocust, eastern white pine, yellow-poplar, radiant crabapple.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
Urban land.				
UgB, UgC*:				
Urban land.				
Elkinsville	Creeping speedwell, Hall honeysuckle, juniper, moss pink, plantain lily.	Forsythia, leatherleaf viburnum, serviceberry, Japanese yew.	Eastern white pine, red pine, white oak, yellow-poplar, black walnut.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
Uh*:				
Urban land.				
Huntington	Forsythia, lilyofthe-valley, myrtle, pachysandra, plantain lily.	Bayberry, redosier dogwood, nannyberry viburnum, Amur privet.	Norway maple, thornless honeylocust, black walnut, yellow-poplar.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.

See footnote at end of table.

TABLE 9.--LANDSCAPE PLANTS--Continued

Soil name and map symbol	Vines and ground cover	Shrubs	Trees	Grasses and legumes
UmB, UmC*: Urban land.				
Martinsville	Creeping thyme, Hall honeysuckle, juniper, moss pink, plantain lily.	Bayberry, redosier dogwood, nannyberry viburnum, Amur privet.	Norway maple, thornless honey- locust, black walnut, yellow- poplar.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
Uo*: Urban land.				
Patton	Bugleweed, European wild ginger, gout- weed, yellow root.	Red chokecherry, redosier dogwood, spice bush, common winterberry.	Red maple, swamp white oak, eastern cottonwood.	Redtop, reed canarygrass.
UrB*: Urban land.				
Rossmoyne	Phlox, honeysuckle, lilyofthevalley, pachysandra, winter creeper.	Red chokecherry, Amur privet, mockorange, inkberry, redosier dogwood.	Eastern white pine, red maple, sweetgum, silver maple.	Tall fescue, redtop, Kentucky bluegrass, crownvetch.
Ux*: Urban land.				
Stonelick	Plantain lily, juniper, moss pink, creeping speedwell.	Leatherleaf viburnum, juniper, service- berry.	Eastern white pine, red pine, white oak, black walnut.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
Wa Wakeland	Goutweed, bugleweed, European wild ginger, sweet woodruff.	Red chokecherry, redosier dogwood, spice bush, common winterberry.	Red maple, river birch, swamp white oak.	Redtop, red fescue, tall fescue.
WbA Warsaw Variant	Plantain lily, juniper, moss pink, creeping thyme.	Leatherleaf viburnum, juniper, service- berry.	Eastern white pine, red pine, white oak, black walnut.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
WeA Wea	Forsythia, lilyofthe- valley, pachysandra.	Leatherleaf viburnum, juniper, service- berry.	Eastern white pine, red pine, white oak, black walnut.	Tall fescue, red fescue, Kentucky bluegrass, crownvetch.
WhA Whitaker	Goutweed, bugleweed, European wild ginger, sweet woodruff, lily turf, yellow root.	Arrowwood, red choke- cherry, redosier dogwood, Amur privet, spice bush.	Sweetgum, poplar, red maple, swamp white oak, London plane tree.	Kentucky bluegrass, redtop, tall fescue.
XfA, XfB2 Xenia	Forsythia, lilyofthe- valley, myrtle, pachysandra, winter creeper.	Forsythia, juniper, nannyberry viburnum, serviceberry.	Eastern white pine, red pine, white oak, yellow-poplar.	Tall fescue, Kentucky bluegrass, crownvetch.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ArA, ArB2: Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
ArC2: Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
AsB*:					
Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
Urban land.					
AsC*:					
Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
Urban land.					
AvA: Avonburg	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
AwA*:					
Avonburg	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Urban land.					
BoD: Bonnell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
BoE, BoF: Bonnell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
CcC2: Casco	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight	Moderate: slope, droughty.
CdD: Casco	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
CdE, CdF: Casco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CnB2: Cincinnati	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
CnC2: Cincinnati	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
DaB: Dana	Slight	Slight	Moderate: slope.	Slight	Slight.
EcB2: Eden	Moderate: percs slowly, small stones.	Moderate: small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: large stones, slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
EcC2: Eden	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope.
EcD, EcE, EdF: Eden	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
EeB*:					
Eden	Moderate: percs slowly, small stones.	Moderate: small stones.	Severe: slope, small stones.	Moderate: small stones.	Moderate: large stones, slope.
Urban land.					
EeC*:					
Eden	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.	Severe: slope.
Urban land.					
EeD*:					
Eden	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Urban land.					
EpA: Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones.	Severe: erodes easily.	Moderate: droughty.
EpB2: Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: droughty.
EpC2: Eldean	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope.
ErA*:					
Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones.	Severe: erodes easily.	Moderate: droughty.
Urban land.					
ErB*:					
Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: droughty.
Urban land.					
FdA: Fincastle	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FeA*:					
Fincastle	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
FoA: Fox	Slight	Slight	Moderate: small stones.	Slight	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
FoB2: Fox	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
FpA*:					
Fox	Slight	Slight	Moderate: small stones.	Slight	Slight.
Urban land.					
Gn: Genesee	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Go*:					
Genesee	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Urban land.					
HeF: Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HoA: Henshaw	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Hu: Huntington	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Ju: Jules	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Lg: Lanier	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: droughty, flooding.
MaB: Markland	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MaC2: Markland	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MaD2, MaE2: Markland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
McA: Martinsville	Slight	Slight	Slight	Slight	Slight.
McB: Martinsville	Slight	Slight	Moderate: slope.	Slight	Slight.
MnC2: Miamian	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MoD2*:					
Miamian	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MoE2*:					
Miamian	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MuC*:					
Miamian	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Urban land.					
PbB2 Parke	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
PbC2 Parke	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
PbD Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
PbE Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
PcB*:					
Parke	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
Urban land.					
PcC*:					
Parke	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Urban land.					
PfC Pate	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: droughty, slope.
PfD Pate	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
PfE Pate	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, erodes easily.	Severe: slope.
PhD*:					
Pate	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
Urban land.					
Pn Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Po*. Pits					
PrA Princeton	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
PrB------------------- Princeton	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
PrC2------------------ Princeton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
RdA------------------- Raub	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Rn-------------------- Ross	Severe: flooding.	Slight----------	Slight----------	Slight------------	Slight.
RpA------------------- Rossmoyne	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
RpB2------------------ Rossmoyne	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
RpC2------------------ Rossmoyne	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.
RtA*:					
Rossmoyne------------	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Urban land.					
RtB*:					
Rossmoyne------------	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Urban land.					
RtC*:					
Rossmoyne------------	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.
Urban land.					
RwB2------------------ Russell	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
RxB*:					
Russell--------------	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
Urban land.					
St-------------------- Stonelick	Severe: flooding.	Moderate: flooding, small stones.	Severe: small stones, flooding.	Moderate: flooding.	Severe: flooding.
SwB2------------------ Switzerland	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight------------	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SwC2------------------ Switzerland	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
SwD2------------------ Switzerland	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
SxB*:					
Switzerland----------	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight------------	Slight.
Urban land.					
SxC*:					
Switzerland----------	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
Urban land.					
Ud*, Uf*. Udorthents					
UgB*:					
Urban land.					
Elkinsville----------	Slight----------	Slight----------	Moderate: slope.	Severe: erodes easily.	Slight.
UgC*:					
Urban land.					
Elkinsville----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Uh*:					
Urban land.					
Huntington-----------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
UmB*:					
Urban land.					
Martinsville---------	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
UmC*:					
Urban land.					
Martinsville---------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Uo*:					
Urban land.					
Patton---------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
UrB*:					
Urban land.					
Rossmoyne------------	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ux*:					
Urban land.					
Stonelick	Severe: flooding.	Moderate: flooding, small stones.	Severe: small stones, flooding.	Moderate: flooding.	Severe: flooding.
Wa Wakeland	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
WbA Warsaw Variant	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
WeA Wea	Slight	Slight	Slight	Slight	Slight.
WhA Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
XfA Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Slight.
XfB2 Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
ArA, ArB2, ArC2----- Ava	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
AsB*, AsC*:										
Ava----------------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										
AvA---------------- Avonburg	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
AwA*:										
Avonburg----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
BoD---------------- Bonnell	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BoE---------------- Bonnell	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
BoF. Bonnell										
CcC2--------------- Casco	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CdD, CdE, CdF------ Casco	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
CnB2--------------- Cincinnati	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CnC2--------------- Cincinnati	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
DaB---------------- Dana	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EcB2--------------- Eden	Fair	Good	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
EcC2--------------- Eden	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
EcD, EcE----------- Eden	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
EdF---------------- Eden	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
EeB*:										
Eden--------------	Fair	Good	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Urban land.										
EeC*:										
Eden--------------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
EeC*: Urban land.										
EeD*: Eden	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Urban land.										
EpA Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EpB2 Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EpC2 Eldean	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ErA*: Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
ErB*: Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
FdA Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FeA*: Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
FoA, FoB2 Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FpA*: Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
Gn Genesee	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Go*: Genesee	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										
HeF Hennepin	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
HoA Henshaw	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Hu Huntington	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ju Jules	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Lg-----------------Lanier	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
MaB----------------Markland	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MaC2---------------Markland	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MaD2, MaE2---------Markland	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
McA, McB-----------Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MnC2---------------Miamian	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MoD2*:										
Miamian-----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Hennepin----------	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
MoE2*:										
Miamian-----------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Hennepin----------	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
MuC*:										
Miamian-----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
PbB2---------------Parke	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PbC2---------------Parke	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PbD----------------Parke	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
PbE----------------Parke	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
PcB*:										
Parke-------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
PcC*:										
Parke-------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
PfC----------------- Pate	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PfD----------------- Pate	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
PfE----------------- Pate	Good	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
PhD*:										
Pate---------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Urban land.										
Pn------------------ Patton	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Po*. Pits										
PrA, PrB------------ Princeton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PrC2---------------- Princeton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RdA----------------- Raub	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Rn------------------ Ross	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RpA----------------- Rossmoyne	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
RpB2---------------- Rossmoyne	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RpC2---------------- Rossmoyne	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RtA*:										
Rossmoyne----------	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										
RtB*:										
Rossmoyne----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
RtC*:										
Rossmoyne----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
RwB2---------------- Russell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RxB*:										
Russell------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
RxB*: Urban land.										
St: Stonelick	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
SwB2: Switzerland	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SwC2: Switzerland	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SwD2: Switzerland	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
SxB*:										
Switzerland	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
SxC*:										
Switzerland	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
Ud*, Uf*. Udorthents										
UgB*: Urban land.										
Elkinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UgC*: Urban land.										
Elkinsville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Uh*: Urban land.										
Huntington	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UmB*: Urban land.										
Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UmC*: Urban land.										
Martinsville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Uo*: Urban land.										
Patton	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
UrB*:										
Urban land.										
Rossmoyne	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ux*:										
Urban land.										
Stonelick	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Wa Wakeland	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
WbA Warsaw Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WeA Wea	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WhA Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
XfA, XfB2 Xenia	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ArA: Ava	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
ArB2: Ava	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.
ArC2: Ava	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
AsB*:						
Ava	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Urban land.						
AsC*:						
Ava	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Urban land.						
AvA: Avonburg	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
AwA*:						
Avonburg	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
BoD, BoE, BoF: Bonnell	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
CcC2: Casco	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
CdD, CdE, CdF: Casco	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CnB2: Cincinnati	Moderate: dense layer, wetness.	Slight	Moderate: wetness.	Moderate: slope, shrink-swell.	Severe: low strength, frost action.	Slight.
CnC2: Cincinnati	Moderate: dense layer, wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope, shrink-swell.	Severe: low strength, frost action.	Moderate: slope.
DaB: Dana	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
EcB2--------------- Eden	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, depth to rock, slope.	Severe: low strength.	Moderate: too clayey.
EcC2--------------- Eden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
EcD, EcE, EdF------ Eden	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, low strength, slippage.	Severe: slope.
EeB*:						
Eden---------------	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, depth to rock, slope.	Severe: low strength.	Moderate: too clayey.
Urban land.						
EeC*						
Eden---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Urban land.						
EeD*:						
Eden---------------	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, low strength, slippage.	Severe: slope.
Urban land.						
EpA---------------- Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight------------	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
EpB2--------------- Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight------------	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
EpC2--------------- Eldean	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope.
ErA*:						
Eldean-------------	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight------------	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
Urban land.						
ErB*:						
Eldean-------------	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight------------	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
Urban land.						
FdA---------------- Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FeA*:						
Fincastle----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Urban land.						
FoA: Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
FoB2: Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
FpA*:						
Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
Urban land.						
Gn: Genesee	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Go*:						
Genesee	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Urban land.						
HeF: Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HoA: Henshaw	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Hu: Huntington	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
Ju: Jules	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
Lg: Lanier	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
MaB: Markland	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
MaC2: Markland	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
MaD2, MaE2: Markland	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
McA: Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
McB: Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MnC2: Miamian	Moderate: too clayey, dense layer, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
MoD2*, MoE2*:						
Miamian	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MuC*:						
Miamian	Moderate: too clayey, dense layer, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Urban land.						
PbB2: Parke	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
PbC2: Parke	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
PbD, PbE: Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
PcB*:						
Parke	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Urban land.						
PcC*:						
Parke	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Urban land.						
PfC: Pate	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: droughty, slope.
PfD, PfE: Pate	Severe: slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, slope, slippage.	Severe: low strength, slope, shrink-swell.	Severe: slope.
PhD*:						
Pate	Severe: slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, slope, slippage.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Urban land.						
Pn: Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: ponding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Po*. Pits						
PrA	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: ponding.	Slight.
PrB Princeton	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
PrC2 Princeton	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
RdA Raub	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Rn Ross	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, frost action.	Slight.
RpA Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
RpB2 Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
RpC2 Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
RtA*: Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
RtB*: Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
RtC*: Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
Urban land.						
RwB2 Russell	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
RxB*: Russell	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Urban land.						

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
St------------------ Stonelick	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
SwB2---------------- Switzerland	Moderate: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
SwC2---------------- Switzerland	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Severe: shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
SwD2---------------- Switzerland	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, slippage.	Severe: low strength, slope, slippage.	Severe: slope.
SxB*:						
Switzerland-------	Moderate: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Urban land.						
SxC*:						
Switzerland-------	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Severe: shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Urban land.						
Ud*, Uf*. Udorthents						
UgB*: Urban land.						
Elkinsville-------	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
UgC*: Urban land.						
Elkinsville-------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Uh*: Urban land.						
Huntington--------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
UmB*: Urban land.						
Martinsville------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
UmC*: Urban land.						
Martinsville------	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Uo*:						
Urban land.						
Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
UrB*:						
Urban land.						
Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
Ux*:						
Urban land.						
Stonelick	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Wa Wakeland	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
WbA Warsaw Variant	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
WeA Wea	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
WhA Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
XfA Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
XfB2 Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ArA, ArB2 Ava	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
ArC2 Ava	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
AsB*:					
Ava	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
Urban land.					
AsC*:					
Ava	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
Urban land.					
AvA Avonburg	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
AwA*:					
Avonburg	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
BoD, BoE, BoF Bonnell	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
CcC2 Casco	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage, small stones.
CdD, CdE, CdF Casco	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: slope, seepage.	Poor: too sandy, seepage, small stones.
CnB2 Cincinnati	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Moderate: too clayey.	Slight	Fair: too clayey.
CnC2 Cincinnati	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
DaB Dana	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Slight	Fair: too clayey, wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EcB2 Eden	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey, thin layer.
EcC2 Eden	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey, thin layer.
EcD, EcE, EdF Eden	Severe: slope, percs slowly, depth to rock.	Severe: slope, slippage.	Severe: slope, too clayey, depth to rock.	Severe: slope, slippage.	Poor: slope, too clayey, thin layer.
EeB*:					
Eden	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey, thin layer.
Urban land.					
EeC*:					
Eden	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey, thin layer.
Urban land.					
EeD*:					
Eden	Severe: slope, percs slowly, depth to rock.	Severe: slope, slippage.	Severe: slope, too clayey, depth to rock.	Severe: slope, depth to rock, slippage.	Poor: slope, too clayey, thin layer.
Urban land.					
EpA, EpB2 Eldean	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
EpC2 Eldean	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
ErA*, ErB*:					
Eldean	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Urban land.					
FdA Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
FeA*:					
Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Urban land.					

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
FoA, FoB2 Fox	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FpA*:					
Fox	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Urban land.					
Gn Genesee	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Go*:					
Genesee	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Urban land.					
HeF Hennepin	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
HoA Henshaw	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Hu Huntington	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Good.
Ju Jules	Severe: flooding.	Moderate: seepage.	Severe: flooding.	Severe: flooding.	Good.
Lg Lanier	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy, small stones.
MaB Markland	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MaC2 Markland	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
MaD2, MaE2 Markland	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
McA Martinsville	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
McB Martinsville	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MnC2: Miamian	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
MoD2*, MoE2*:					
Miamian	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Hennepin	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MuC*:					
Miamian	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
Urban land.					
PbB2: Parke	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
PbC2: Parke	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
PbD, PbE: Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
PcB*:					
Parke	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Urban land.					
PcC*:					
Parke	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Urban land.					
PfC: Pate	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
PfD, PfE: Pate	Severe: percs slowly, slope, slippage.	Severe: slope, slippage.	Severe: depth to rock, slope, too clayey.	Severe: slope, slippage.	Poor: too clayey, hard to pack, slope.
PhD*:					
Pate	Severe: percs slowly, slope, slippage.	Severe: slope, slippage.	Severe: depth to rock, slope, too clayey.	Severe: slope, slippage.	Poor: too clayey, hard to pack, slope.
Urban land.					
Pn: Patton	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Po*. Pits					

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PrA, PrB: Princeton	Slight	Severe: seepage.	Severe: seepage.	Slight	Good.
PrC2: Princeton	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope.
RdA: Raub	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Rn: Ross	Moderate: flooding, wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Good.
RpA: Rossmoyne	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
RpB2: Rossmoyne	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
RpC2: Rossmoyne	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
RtA*:					
Rossmoyne	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Urban land.					
RtB*:					
Rossmoyne	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Urban land.					
RtC*:					
Rossmoyne	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
Urban land.					
RwB2: Russell	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
RxB*:					
Russell	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Urban land.					
St: Stonelick	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage.
SwB2: Switzerland	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SwC2: Switzerland	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
SwD2: Switzerland	Severe: percs slowly, slope, slippage.	Severe: slope, slippage.	Severe: slope, too clayey, slippage.	Severe: slope, slippage.	Poor: too clayey, hard to pack, slope.
SxB*:					
Switzerland	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Urban land.					
SxC*:					
Switzerland	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Urban land.					
Ud*, Uf*. Udorthents					
UgB*:					
Urban land.					
Elkinsville	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
UgC*:					
Urban land.					
Elkinsville	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Uh*:					
Urban land.					
Huntington	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Good.
UmB*:					
Urban land.					
Martinsville	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
UmC*:					
Urban land.					
Martinsville	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope, thin layer.
Uo*:					
Urban land.					
Patton	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
UrB*: Urban land.					
Rossmoyne	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Ux*: Urban land.					
Stonelick	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage.
Wa Wakeland	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
WbA Warsaw Variant	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
WeA Wea	Slight	Moderate: seepage.	Severe: seepage.	Slight	Fair: too clayey.
WhA Whitaker	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
XfA, XfB2 Xenia	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ArA, ArB2: Ava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
ArC2: Ava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
AsB*:				
Ava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
AsC*:				
Ava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Urban land.				
AvA: Avonburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
AwA*:				
Avonburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Urban land.				
BoD: Bonnell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
BoE, BoF: Bonnell	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
CcC2: Casco	Good	Probable	Probable	Poor: area reclaim, small stones.
CdD: Casco	Fair: slope.	Probable	Probable	Poor: slope, area reclaim, small stones.
CdE, CdF: Casco	Poor: slope.	Probable	Probable	Poor: slope, area reclaim, small stones.
CnB2: Cincinnati	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
CnC2: Cincinnati	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
DaB: Dana	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EcB2: Eden	Poor: thin layer, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
EcC2: Eden	Poor: thin layer, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, small stones.
EcD, EcE, EdF: Eden	Poor: slope, thin layer, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, small stones.
EeB*:				
Eden	Poor: thin layer, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
Urban land.				
EeC*:				
Eden	Poor: thin layer, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, small stones.
Urban land.				
EeD*:				
Eden	Poor: slope, thin layer, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, small stones.
Urban land.				
EpA, EpB2, EpC2: Eldean	Good	Probable	Probable	Poor: small stones, area reclaim.
ErA*, ErB*:				
Eldean	Good	Probable	Probable	Poor: small stones, area reclaim.
Urban land.				
FdA: Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
FeA*:				
Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
FoA, FoB2: Fox	Good	Probable	Probable	Poor: small stones, area reclaim.
FpA*:				
Fox	Good	Probable	Probable	Poor: small stones, area reclaim.
Urban land.				

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Gn: Genesee	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Go*:				
Genesee	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
HeF: Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HoA: Henshaw	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hu: Huntington	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ju: Jules	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Lg: Lanier	Good	Probable	Probable	Poor: small stones, area reclaim.
MaB, MaC2: Markland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MaD2, MaE2: Markland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
McA, McB: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MnC2: Miamian	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
MoD2*:				
Miamian	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MoE2*:				
Miamian	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MuC*:				
Miamian	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
Urban land.				
PbB2: Parke	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PbC2: Parke	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
PbD: Parke	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
PbE: Parke	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
PcB*:				
Parke	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Urban land.				
PcC*:				
Parke	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Urban land.				
PfC: Pate	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
PfD: Pate	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
PfE: Pate	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
PhD*:				
Pate	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Urban land.				
Pn: Patton	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Po*. Pits				
PrA, PrB: Princeton	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
PrC2: Princeton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
RdA: Raub	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Rn: Ross	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
RpA, RpB2: Rossmoyne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
RpC2: Rossmoyne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RtA*, RtB*:				
Rossmoyne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Urban land.				
RtC*:				
Rossmoyne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
Urban land.				
RwB2 Russell	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
RxB*:				
Russell	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
St Stonelick	Good	Probable	Improbable: too sandy.	Poor: small stones.
SwB2 Switzerland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
SwC2 Switzerland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
SwD2 Switzerland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
SxB*:				
Switzerland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Urban land.				
SxC*:				
Switzerland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Urban land.				
Ud*, Uf*. Udorthents				
UgB*:				
Urban land.				
Elkinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
UgC*:				
Urban land.				
Elkinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Uh*:				
Urban land.				

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Uh*:				
Huntington	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
UmB*:				
Urban land.				
Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
UmC*:				
Urban land.				
Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Uo*:				
Urban land.				
Patton	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
UrB*:				
Urban land.				
Rossmoyne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Ux*:				
Urban land.				
Stonelick	Good	Probable	Improbable: too sandy.	Poor: small stones.
Wa Wakeland	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
WbA Warsaw Variant	Good	Probable	Probable	Poor: small stones, area reclaim.
WeA Wea	Good	Probable	Probable	Fair: small stones.
WhA Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
XfA, XfB2 Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
ArA, ArB2: Ava	Moderate: slope.	Severe: piping.	Severe: no water.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
ArC2: Ava	Severe: slope.	Severe: piping.	Severe: no water.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
AsB*:						
Ava	Moderate: slope.	Severe: piping.	Severe: no water.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
Urban land.						
AsC*:						
Ava	Severe: slope.	Severe: piping.	Severe: no water.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Urban land.						
AvA: Avonburg	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
AwA*:						
Avonburg	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
Urban land.						
BoD, BoE, BoF: Bonnell	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
CcC2, CdD, CdE, CdF: Casco	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Droughty, slope.	Slope, too sandy.	Droughty, slope.
CnB2: Cincinnati	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Percs slowly, rooting depth, slope.	Erodes easily, rooting depth.	Erodes easily, rooting depth.
CnC2: Cincinnati	Severe: slope.	Moderate: piping.	Severe: no water.	Percs slowly, rooting depth, slope.	Slope, erodes easily, rooting depth.	Slope, erodes easily, rooting depth.
DaB: Dana	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Slope	Erodes easily	Erodes easily.
EcB2: Eden	Moderate: depth to rock.	Moderate: hard to pack, thin layer, large stones.	Severe: no water.	Slope, erodes easily, slow intake.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
EcC2: Eden	Moderate: depth to rock.	Moderate: hard to pack, thin layer.	Severe: no water.	Slope, erodes easily, slow intake.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Irrigation	Terraces and diversions	Grassed waterways
EcD, EcE, EdF Eden	Severe: slippage.	Moderate: hard to pack, thin layer.	Severe: no water.	Slope, erodes easily.	Slope, percs slowly, slippage.	Slope, erodes easily, percs slowly.
EeB*:						
Eden	Moderate: depth to rock.	Moderate: hard to pack, thin layer.	Severe: no water.	Slope, erodes easily, slow intake.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Urban land.						
EeC*:						
Eden	Moderate: depth to rock.	Moderate: hard to pack, thin layer.	Severe: no water.	Slope, erodes easily, slow intake.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Urban land.						
EeD*:						
Eden	Severe: slippage.	Moderate: hard to pack, thin layer.	Severe: no water.	Slope, erodes easily, slow intake.	Slope, percs slowly, slippage.	Slope, erodes easily, percs slowly.
Urban land.						
EpA Eldean	Severe: seepage.	Severe: seepage.	Severe: no water.	Droughty, erodes easily.	Erodes easily, too sandy.	Erodes easily, droughty.
EpB2 Eldean	Severe: seepage.	Severe: seepage.	Severe: no water.	Droughty, slope, erodes easily.	Erodes easily, too sandy.	Erodes easily, droughty.
EpC2 Eldean	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Droughty, slope, erodes easily.	Slope, erodes easily, too sandy.	Slope, erodes easily, droughty.
ErA*:						
Eldean	Severe: seepage.	Severe: seepage.	Severe: no water.	Droughty, erodes easily.	Erodes easily, too sandy.	Erodes easily, droughty.
Urban land.						
ErB*:						
Eldean	Severe: seepage.	Severe: seepage.	Severe: no water.	Droughty, slope, erodes easily.	Erodes easily, too sandy.	Erodes easily, droughty.
Urban land.						
FdA Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
FeA*:						
Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
Urban land.						
FoA Fox	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Rooting depth	Too sandy	Rooting depth.
FoB2 Fox	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Rooting depth, slope.	Too sandy	Rooting depth.
FpA*:						
Fox	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Rooting depth	Too sandy	Rooting depth.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Irrigation	Terraces and diversions	Grassed waterways
FpA*:						
Urban land.						
Gn----------------- Genesee	Moderate: seepage.	Moderate: piping.	Severe: no water.	Erodes easily, flooding.	Erodes easily	Erodes easily.
Go*:						
Genesee----------	Moderate: seepage.	Moderate: piping.	Severe: no water.	Erodes easily, flooding.	Erodes easily	Erodes easily.
Urban land.						
HeF---------------- Hennepin	Severe: slope.	Severe: piping.	Severe: no water.	Droughty, percs slowly.	Slope, percs slowly.	Slope, droughty, percs slowly.
HoA---------------- Henshaw	Slight----------	Severe: piping, wetness.	Severe: slow refill.	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
Hu----------------- Huntington	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding-------	Favorable------	Favorable.
Ju----------------- Jules	Moderate: seepage.	Severe: piping.	Severe: no water.	Erodes easily, flooding.	Erodes easily	Erodes easily.
Lg----------------- Lanier	Severe: seepage.	Severe: seepage.	Severe: no water.	Droughty, soil blowing, flooding.	Too sandy, soil blowing.	Droughty.
MaB---------------- Markland	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
MaC2, MaD2, MaE2-- Markland	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
McA---------------- Martinsville	Moderate: seepage.	Severe: thin layer.	Severe: no water.	Favorable------	Erodes easily	Erodes easily.
McB---------------- Martinsville	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Slope----------	Erodes easily	Erodes easily.
MnC2--------------- Miamian	Severe: slope.	Severe: piping.	Severe: no water.	Rooting depth, slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily, rooting depth.
MoD2*, MoE2*:						
Miamian----------	Severe: slope.	Severe: piping.	Severe: no water.	Rooting depth, slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily, rooting depth.
Hennepin---------	Severe: slope.	Severe: piping.	Severe: no water.	Droughty, percs slowly.	Slope, percs slowly.	Slope, droughty, percs slowly.
MuC*:						
Miamian----------	Severe: slope.	Severe: piping.	Severe: no water.	Rooting depth, slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily, rooting depth.
Urban land.						
PbB2--------------- Parke	Moderate: seepage, slope.	Slight----------	Severe: no water.	Slope, erodes easily.	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Irrigation	Terraces and diversions	Grassed waterways
PbC2, PbD, PbE: Parke	Severe: slope.	Slight	Severe: no water.	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
PcB*:						
Parke	Moderate: seepage, slope.	Slight	Severe: no water.	Slope, erodes easily.	Erodes easily	Erodes easily.
Urban land.						
PcC*:						
Parke	Severe: slope.	Slight	Severe: no water.	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Urban land.						
PfC: Pate	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Droughty, percs slowly, slope.	Slope, large stones, erodes easily.	Slope, erodes easily, droughty.
PfD, PfE: Pate	Severe: slope, slippage.	Moderate: hard to pack.	Severe: no water.	Droughty, percs slowly, slope.	Slope, large stones, erodes easily.	Slope, erodes easily, droughty.
PhD*:						
Pate	Severe: slope, slippage.	Moderate: hard to pack.	Severe: no water.	Droughty, percs slowly, slope.	Slope, large stones, erodes easily.	Slope, erodes easily, droughty.
Urban land.						
Pn: Patton	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding	Ponding	Wetness.
Po*. Pits						
PrA: Princeton	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Soil blowing	Soil blowing	Favorable.
PrB: Princeton	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Soil blowing, slope.	Soil blowing	Favorable.
PrC2: Princeton	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Soil blowing, slope.	Slope, soil blowing.	Slope.
RdA: Raub	Slight	Severe: wetness.	Severe: slow refill.	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Rn: Ross	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Favorable	Favorable	Favorable.
RpA: Rossmoyne	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
RpB2: Rossmoyne	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
RpC2: Rossmoyne	Severe: slope.	Moderate: piping, wetness.	Severe: no water.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Irrigation	Terraces and diversions	Grassed waterways
RtA*:						
Rossmoyne	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
Urban land.						
RtB*:						
Rossmoyne	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
Urban land.						
RtC*:						
Rossmoyne	Severe: slope.	Moderate: piping, wetness.	Severe: no water.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Urban land.						
RwB2 Russell	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Slope, erodes easily.	Erodes easily	Erodes easily.
RxB*:						
Russell	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Slope, erodes easily.	Erodes easily	Erodes easily.
Urban land.						
St Stonelick	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Droughty, flooding.	Too sandy, soil blowing.	Droughty.
SwB2 Switzerland	Moderate: seepage, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
SwC2 Switzerland	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
SwD2 Switzerland	Severe: slope, slippage.	Moderate: thin layer, hard to pack.	Severe: no water.	Percs slowly, slope, erodes easily.	Slope, percs slowly, slippage.	Slope, erodes easily, percs slowly.
SxB*:						
Switzerland	Moderate: seepage, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Urban land.						
SxC*:						
Switzerland	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Urban land.						
Ud*, Uf*. Udorthents						
UgB*:						
Urban land.						
Elkinsville	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Slope, erodes easily.	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Irrigation	Terraces and diversions	Grassed waterways
Uh*: Urban land.						
Huntington	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding	Favorable	Favorable.
UmB*: Urban land.						
Martinsville	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Slope	Erodes easily	Erodes easily.
UmC*: Urban land.						
Martinsville	Severe: slope.	Severe: thin layer.	Severe: no water.	Slope	Slope, erodes easily.	Slope, erodes easily.
Uo*: Urban land.						
Patton	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding	Ponding	Wetness.
UrB*: Urban land.						
Rossmoyne	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
Ux*: Urban land.						
Stonelick	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Droughty, flooding.	Too sandy, soil blowing.	Droughty.
Wa: Wakeland	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
WbA: Warsaw Variant	Severe: seepage.	Severe: seepage.	Severe: no water.	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
WeA: Wea	Moderate: seepage.	Moderate: thin layer.	Severe: no water.	Favorable	Erodes easily	Erodes easily.
WhA: Whitaker	Moderate: seepage.	Severe: wetness.	Moderate: slow refill, cutbanks cave.	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
XfA: Xenia	Moderate: seepage.	Moderate: thin layer, wetness.	Severe: slow refill.	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
XfB2: Xenia	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Severe: slow refill.	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ArA, ArB2, ArC2--Ava	0-9	Silt loam	CL	A-6, A-4	0	100	95-100	95-100	85-100	25-40	9-17
	9-33	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	95-100	30-45	15-25
	33-86	Silty clay loam, silt loam, silty clay.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	90-100	70-90	20-45	5-20
AsB*, AsC*:											
Ava	0-9	Silt loam	CL	A-6, A-4	0	100	95-100	95-100	85-100	25-40	9-17
	9-33	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	95-100	30-45	15-25
	33-76	Silty clay loam, silt loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	90-100	70-90	20-45	5-20
Urban land.											
AvA--Avonburg	0-14	Silt loam	CL, ML, CL-ML	A-4	0	100	100	95-100	75-95	20-30	2-10
	14-25	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	75-95	30-45	10-20
	25-53	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-3	95-100	95-100	90-100	70-95	30-45	10-20
	53-85	Clay loam, loam	CL	A-6, A-7	0-3	95-100	90-100	75-95	60-85	30-45	10-20
AwA*:											
Avonburg	0-14	Silt loam	CL, ML, CL-ML	A-4	0	100	100	95-100	75-95	20-30	2-10
	14-25	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	75-95	30-45	10-20
	25-53	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-3	95-100	95-100	90-100	70-95	30-45	10-20
	53-85	Clay loam, loam	CL	A-6, A-7	0-3	95-100	90-100	75-95	60-85	30-45	10-20
Urban land.											
BoD, BoE, BoF--Bonnell	0-16	Silt loam	ML, CL-ML, CL	A-4, A-6	0	100	100	85-100	65-90	25-35	4-12
	16-52	Silty clay, clay, clay loam.	CH	A-7	0	100	100	90-100	75-95	50-65	30-40
	52-72	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-95	60-80	35-50	20-30
CcC2--Casco	0-5	Gravelly loam	SM-SC, SC, CL, CL-ML	A-4, A-2, A-1, A-6	0	60-75	50-75	40-75	20-65	<25	5-15
	5-17	Clay loam, sandy clay loam, gravelly clay loam.	SC, CL, GC	A-6, A-7, A-2	0-5	60-100	55-100	55-90	25-70	25-45	11-25
	17-60	Stratified sand to gravel.	GP, SP, GP-GM, SP-SM	A-1, A-3, A-2	0-10	30-100	30-100	10-70	3-10	---	NP
CdD, CdE, CdF--Casco	0-4	Loam	ML, CL-ML, CL	A-4	0	95-100	90-100	75-100	50-90	20-30	3-10
	4-15	Clay loam, sandy clay loam, gravelly clay loam.	SC, CL, GC	A-6, A-7, A-2	0-5	60-100	55-100	55-90	25-70	25-45	11-25
	15-60	Stratified sand to gravel.	GP, SP, GP-GM, SP-SM	A-1, A-3, A-2	0-10	30-100	30-100	10-70	3-10	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
CnB2, CnC2: Cincinnati	0-7	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	80-100	25-40	3-16
	7-30	Silty clay loam, loam, silt loam.	CL	A-6, A-4	0	95-100	90-100	90-100	70-100	26-40	8-15
	30-46	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	85-100	75-95	65-85	25-40	6-20
	46-70	Clay loam, loam	CL, ML, CL-ML	A-6, A-4	0	95-100	85-100	75-95	65-85	25-40	5-20
	70-86	Clay loam, loam	CL, CL-ML	A-6, A-4	0	90-100	80-100	70-95	55-85	25-40	5-20
DaB: Dana	0-14	Silt loam	CL	A-6, A-4	0	100	100	95-100	85-95	30-35	8-12
	14-30	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-98	38-50	20-32
	30-44	Clay loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	37-50	17-30
	44-60	Loam	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	17-30	2-14
EcB2, EcC2, EcD, EcE: Eden	0-5	Silty clay loam	ML, CL, MH, CH	A-7, A-6	0-15	85-100	80-100	75-100	70-100	35-65	12-35
	5-28	Silty clay loam, flaggy clay, silty clay.	MH, CH, CL	A-7	10-45	75-100	70-100	65-100	65-95	45-75	20-45
	28-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
EdF: Eden	0-5	Flaggy silty clay loam.	ML, CL, MH, CH	A-7, A-6	25-40	75-95	70-95	70-95	65-95	35-65	12-35
	5-21	Flaggy silty clay, clay, silty clay.	MH, CH, CL	A-7	10-45	75-100	70-100	65-100	65-95	45-75	20-45
	21-30	Weathered bedrock	---	---	---	---	---	---	---	---	---
EeB*, EeC*, EeD*: Eden	0-5	Silty clay loam	ML, CL, MH, CH	A-7, A-6	0-15	85-100	80-100	75-100	70-100	35-65	12-35
	5-28	Silty clay loam, flaggy clay, silty clay.	MH, CH, CL	A-7	10-45	75-100	70-100	65-100	65-95	45-75	20-45
	28-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
EpA, EpB2, EpC2: Eldean	0-7	Loam	ML, CL-ML, CL	A-4, A-6	0	85-100	80-100	70-100	55-90	20-40	4-14
	7-36	Clay, clay loam, gravelly clay loam.	CL, ML	A-7, A-6	0-5	75-100	60-100	55-95	50-80	38-50	12-23
	36-60	Stratified sand to gravel.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	30-70	20-50	5-40	0-35	---	NP
ErA*, ErB*: Eldean	0-7	Loam	ML, CL-ML, CL	A-4, A-6	0	85-100	80-100	70-100	55-90	20-40	4-14
	7-36	Clay, clay loam, gravelly clay loam.	CL, ML	A-7, A-6	0-5	75-100	60-100	55-95	50-80	38-50	12-23
	36-60	Stratified sand to gravel.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	30-70	20-50	5-40	0-35	---	NP
Urban land.											
FdA: Fincastle	0-8	Silt loam	CL, ML	A-4, A-6	0	100	95-100	90-100	75-93	27-36	4-12
	8-33	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	33-42	Clay loam, loam, silty clay loam.	CH, CL	A-7	0	95-100	90-98	85-95	75-85	45-58	30-38
	42-70	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-3	88-96	82-90	70-86	50-66	20-35	3-12

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
FeA*:											
Fincastle	0-8	Silt loam	CL, ML	A-4, A-6	0	100	95-100	90-100	75-93	27-36	4-12
	8-33	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	33-42	Clay loam, loam, silty clay loam.	CH, CL	A-7	0	95-100	90-98	85-95	75-85	45-58	30-38
	42-70	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-3	88-96	82-90	70-86	50-66	20-35	3-12
Urban land.											
FoA, FoB2 Fox	0-8	Loam	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	8-34	Gravelly sandy clay loam, loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	70-95	50-95	20-65	25-45	10-25
	34-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
FpA*:											
Fox	0-8	Loam	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	8-34	Gravelly sandy clay loam, loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	70-95	50-95	20-65	25-45	10-25
	34-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
Urban land.											
Gn Genesee	0-9	Loam	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	9-35	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	35-60	Stratified sandy loam to silt loam.	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	60-90	50-90	20-35	3-15
Go*:											
Genesee	0-9	Loam	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	9-35	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	35-60	Stratified sandy loam to silt loam.	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	60-90	50-90	20-35	3-15
Urban land.											
HeF Hennepin	0-2	Silt loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
	2-12	Loam, sandy loam, silt loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
	12-60	Loam, sandy loam, clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
HoA Henshaw	0-8	Silt loam	ML, CL, CL-ML	A-4	0	95-100	95-100	90-100	80-100	20-35	3-10
	8-44	Silty clay loam, silt loam.	CL, ML	A-6, A-4	0	95-100	95-100	95-100	85-100	30-40	8-18
	44-66	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-15
Hu Huntington	0-11	Silt loam	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-40	5-15
	11-68	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-40	5-15
	68-80	Stratified sandy clay loam to silt loam.	SM, SC, ML, CL	A-2, A-4	0	95-100	60-100	50-90	30-75	<30	NP-10
Ju Jules	0-72	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
Lg---------------- Lanier	0-17	Sandy loam--------	SM, SM-SC	A-2, A-4	0	90-100	80-100	50-70	25-40	<25	NP-7
	17-72	Stratified very gravelly sand to gravelly sandy loam.	GW, SW, GP, SP	A-1	0-20	35-70	20-55	10-45	0-20	---	NP
MaB, MaC2, MaD2, MaE2------------- Markland	0-10	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
	10-33	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	33-60	Stratified clay to silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	75-95	35-60	20-35
McA, McB---------- Martinsville	0-9	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	9-34	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	34-44	Sandy loam, sandy clay loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	44-60	Stratified sand to loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9
MnC2-------------- Miamian	0-6	Silt loam---------	ML	A-4, A-6	0	95-100	95-100	90-100	70-95	26-40	4-12
	6-27	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0-5	85-100	80-100	75-95	70-85	32-50	15-30
	27-60	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-5	75-95	75-90	65-85	50-75	20-35	3-13
MoD2*, MoE2*:											
Miamian----------	0-6	Silt loam---------	ML	A-4, A-6	0	95-100	95-100	90-100	70-95	26-40	4-12
	6-24	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0-5	85-100	80-100	75-95	70-85	32-50	15-30
	24-60	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-5	75-95	75-90	65-85	50-75	20-35	3-13
Hennepin---------	0-2	Silt loam---------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
	2-12	Loam, sandy loam, silt loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
	12-60	Loam, sandy loam, clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
MuC*:											
Miamian----------	0-6	Silt loam---------	ML	A-4, A-6	0	95-100	95-100	90-100	70-95	26-40	4-12
	6-27	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0-5	85-100	80-100	75-95	70-85	32-50	15-30
	27-60	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-5	75-95	75-90	65-85	50-75	20-35	3-13
Urban land.											
PbB2, PbC2, PbD, PbE-------------- Parke	0-18	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	18-36	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	80-100	25-45	10-25
	36-90	Sandy clay loam, clay loam, sandy loam.	SC, CL	A-2, A-6	0-3	90-100	85-95	55-90	30-60	25-35	10-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
PaB*, PcC*:											
Parke------------	0-18	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	18-36	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	80-100	25-45	10-25
	36-90	Sandy clay loam, clay loam, sandy loam.	SC, CL	A-2, A-6	0-3	90-100	85-95	55-90	30-60	25-35	10-15
Urban land.											
PfC, PfD, PfE---- Pate	0-10	Silty clay loam	CL	A-6, A-7	0-5	90-100	85-100	80-100	75-100	35-50	20-32
	10-37	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	90-100	85-100	80-100	70-100	45-65	25-40
	37-54	Flaggy silty clay, very flaggy clay.	CL, CH	A-6, A-7	5-40	75-100	70-100	65-100	60-75	25-55	10-30
	54-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
PhD*:											
Pate------------	0-10	Silty clay loam	CL	A-6, A-7	0-5	90-100	85-100	80-100	75-100	35-50	20-32
	10-37	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	90-100	85-100	80-100	70-100	45-65	25-40
	37-54	Flaggy silty clay, very flaggy clay.	CL, CH	A-6, A-7	5-40	75-100	70-100	65-100	60-75	25-55	10-30
	54-72	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
Pn--------------- Patton	0-14	Silty clay loam	CL	A-6	0	100	100	95-100	75-95	30-40	15-25
	14-37	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	80-100	40-55	15-25
	37-60	Stratified silt loam to silty clay loam.	CL	A-6	0	100	100	95-100	75-95	25-40	10-20
Po*. Pits											
PrA, PrB, PrC2--- Princeton	0-10	Sandy loam-------	SM, SC, ML, CL	A-4, A-2-4	0	100	100	60-85	30-55	<25	NP-10
	10-40	Sandy clay loam, sandy loam, loam.	SC, CL	A-6	0	100	100	70-90	35-70	25-35	10-15
	40-57	Stratified loamy fine sand to loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	100	100	60-90	30-70	15-25	5-15
	57-75	Stratified fine sand to silt.	SM, ML, CL-ML, SM-SC	A-2-4, A-4	0	100	100	65-90	20-55	<20	NP-5
RdA-------------- Raub	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-95	25-35	5-15
	13-38	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	80-95	35-55	20-35
	38-51	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	90-100	85-95	60-85	35-50	15-25
	51-60	Loam, clay loam	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	70-85	40-65	15-30	NP-15
Rn--------------- Ross	0-16	Loam-------------	ML, CL-ML, CL	A-4, A-6	0	90-100	90-100	80-100	65-95	20-35	NP-12
	16-37	Loam, silt loam, silty clay loam.	ML, CL, CL-ML	A-6, A-4, A-7	0	90-100	85-100	70-100	55-95	22-45	3-20
	37-60	Stratified gravelly sandy loam to silt loam.	CL, ML, SM, GM	A-6, A-4, A-2, A-1	0-5	65-100	55-100	35-100	20-80	<30	NP-12

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RpA, RpB2, RpC2-- Rossmoyne	0-12	Silt loam--------	ML	A-4	0	90-100	90-100	90-100	85-100	30-40	4-10
	12-26	Silty clay loam, silt loam, clay loam.	CL, ML	A-6, A-7, A-4	0	90-100	90-100	85-100	75-95	30-48	8-20
	26-49	Clay loam, loam, silty clay loam.	CL	A-6, A-4	0	90-100	85-95	80-90	70-85	25-40	9-19
	49-92	Clay loam, loam, clay.	CL	A-6, A-7, A-4	0	80-95	70-90	65-85	60-80	25-42	8-20
RtA*, RtB*, RtC*:											
Rossmoyne-------	0-12	Silt loam--------	ML	A-4	0	90-100	90-100	90-100	85-100	30-40	4-10
	12-26	Silty clay loam, silt loam, clay loam.	CL, ML	A-6, A-7, A-4	0	90-100	90-100	85-100	75-95	30-48	8-20
	26-49	Clay loam, loam, silty clay loam.	CL	A-6, A-4	0	90-100	85-95	80-90	70-85	25-40	9-19
	49-92	Clay loam, loam, clay.	CL	A-6, A-7, A-4	0	80-95	70-90	65-85	60-80	25-42	8-20
Urban land.											
RwB2------------- Russell	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	20-35	5-15
	7-22	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-35
	22-43	Clay loam, loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	35-50	17-31
	43-72	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	<30	2-14
RxB*:											
Russell---------	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	20-35	5-15
	7-22	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-35
	22-43	Clay loam, loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	35-50	17-31
	43-72	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	<30	2-14
Urban land.											
St--------------- Stonelick	0-10	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	85-100	70-100	45-75	25-55	<24	NP-6
	10-72	Stratified loam to loamy sand.	SM, SP-SM	A-2, A-4, A-3, A-1-B	0	85-100	70-95	40-60	5-40	<15	NP
SwB2, SwC2, SwD2- Switzerland	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	90-100	80-100	20-40	5-15
	6-24	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	85-100	25-45	15-25
	24-64	Silty clay, clay	CL, CH	A-7	0	95-100	90-100	85-100	75-95	45-65	25-40
	64-99	Shaly clay, silty clay, flaggy clay.	CL, CH	A-7	5-25	65-85	60-85	55-85	55-80	40-60	20-35
SxB*, SxC*:											
Switzerland-----	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	90-100	80-100	20-40	5-15
	6-24	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	85-100	25-45	15-25
	24-64	Silty clay, clay	CL, CH	A-7	0	95-100	90-100	85-100	75-95	45-65	25-40
Urban land.											
Ud*, Uf*. Udorthents											
UgB*, UgC*: Urban land.											

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
UgB*, UgC*: Elkinsville-----	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-40	5-15
	11-45	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	85-100	65-90	30-40	8-18
	45-60	Silty clay loam, loam, sandy clay loam.	CL	A-4, A-6	0	100	100	80-100	50-90	30-40	8-18
	60-80	Stratified silty clay loam to sandy loam.	CL, CL-ML, ML, SM	A-4, A-6	0	100	100	70-100	45-80	<30	NP-15
Uh*: Urban land.											
Huntington------	0-11	Silt loam--------	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-40	5-15
	11-68	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-40	5-15
	68-80	Stratified sandy clay loam to silt loam.	SM, SC, ML, CL	A-2, A-4	0	95-100	60-100	50-90	30-75	<30	NP-10
UmB*, UmC*: Urban land.											
Martinsville----	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	9-34	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	34-44	Sandy loam, sandy clay loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	44-60	Stratified sand to loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9
Uo*: Urban land.											
Patton----------	0-14	Silty clay loam	CL	A-6	0	100	100	95-100	75-95	30-40	15-25
	14-37	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	80-100	40-55	15-25
	37-60	Stratified silt loam to silty clay loam.	CL	A-6	0	100	100	95-100	75-95	25-40	10-20
UrB*: Urban land.											
Rossmoyne-------	0-12	Silt loam--------	ML	A-4	0	90-100	90-100	90-100	85-100	30-40	4-10
	12-26	Silty clay loam, silt loam, clay loam.	CL, ML	A-6, A-7, A-4	0	90-100	90-100	85-100	75-95	30-48	8-20
	26-49	Clay loam, loam, silty clay loam.	CL	A-6, A-4	0	90-100	85-95	80-90	70-85	25-40	9-19
	49-92	Clay loam, loam, clay.	CL	A-6, A-7, A-4	0	80-95	70-90	65-85	60-80	25-42	8-20
Ux*: Urban land.											
Stonelick-------	0-10	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	85-100	70-100	45-75	25-55	<24	NP-6
	10-72	Stratified loam to loamy sand.	SM, SP-SM	A-2, A-4, A-3, A-1-B	0	85-100	70-95	40-60	5-40	<15	NP
Wa--------------- Wakeland	0-8	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	8-60	Silt loam, loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WbA--------------- Warsaw Variant	0-14	Sandy loam-------	SC, SM-SC	A-2, A-4	0	80-100	75-100	50-70	25-40	20-30	4-10
	14-31	Sandy loam, loam, gravelly sandy loam.	SC, ML	A-2, A-4	0-3	80-100	60-90	40-60	20-40	30-40	6-16
	31-60	Stratified loamy sand to very gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0-5	45-75	25-50	15-35	2-15	<20	NP
WeA--------------- Wea	0-15	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	15-30	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	95-100	90-95	85-95	65-90	35-50	15-30
	30-59	Gravelly loam, sandy loam.	CL, SM-SC, SC, CL-ML	A-4, A-6	0-5	70-85	65-85	60-80	35-65	15-30	5-15
	59-70	Stratified sand to very gravelly loamy sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	0-10	---	NP
WhA--------------- Whitaker	0-9	Loam-------------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	4-12
	9-45	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-47	12-26
	45-60	Stratified coarse sand to clay.	CL, SC, ML, SM	A-4	0	98-100	98-100	60-85	40-60	15-25	3-9
XfA, XfB2--------- Xenia	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	9-26	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	26-46	Clay loam--------	CL	A-6, A-7	0-5	92-100	90-95	75-95	65-75	35-50	15-30
	46-72	Loam-------------	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	75-90	40-65	15-30	NP-15

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
ArA, ArB2, ArC2--	0-9	20-27	1.30-1.50	0.6-2.0	0.22-0.24	3.6-7.3	Moderate-----	0.43	4	6	1-3
Ava	9-33	22-35	1.40-1.60	0.2-0.6	0.18-0.20	3.6-5.5	Moderate-----	0.43			
	33-86	20-30	1.65-1.80	<0.06	0.05-0.08	3.6-5.5	Moderate-----	0.43			
AsB*, AsC*:											
Ava--------------	0-9	20-27	1.30-1.50	0.6-2.0	0.22-0.24	3.6-7.3	Moderate-----	0.43	4	6	1-3
	9-33	22-35	1.40-1.60	0.2-0.6	0.18-0.20	3.6-5.5	Moderate-----	0.43			
	33-76	20-30	1.65-1.80	<0.06	0.05-0.08	3.6-5.5	Moderate-----	0.43			
Urban land.											
AvA---------------	0-14	10-18	1.30-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low-----------	0.43	4	5	.5-2
Avonburg	14-25	22-30	1.35-1.50	0.6-2.0	0.18-0.20	4.5-5.5	Moderate-----	0.43			
	25-53	22-30	1.60-1.85	<0.06	0.06-0.08	4.5-5.5	Moderate-----	0.43			
	53-85	14-30	1.50-1.70	<0.06	0.06-0.10	4.5-8.4	Moderate-----	0.43			
AwA*:											
Avonburg---------	0-14	10-18	1.30-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low-----------	0.43	4	5	.5-2
	14-25	22-30	1.35-1.50	0.6-2.0	0.18-0.20	4.5-5.5	Moderate-----	0.43			
	25-53	22-30	1.60-1.85	<0.06	0.06-0.08	4.5-5.5	Moderate-----	0.43			
	53-85	14-30	1.50-1.70	<0.06	0.06-0.10	4.5-8.4	Moderate-----	0.43			
Urban land.											
BoD, BoE, BoF----	0-16	15-25	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	5	1-3
Bonnell	16-52	40-60	1.50-1.70	0.06-0.2	0.09-0.13	4.5-6.0	High----------	0.32			
	52-72	27-40	1.45-1.60	0.2-0.6	0.14-0.19	7.4-8.4	Moderate-----	0.32			
CcC2--------------	0-5	10-25	1.40-1.70	0.6-2.0	0.10-0.17	5.6-7.3	Low-----------	0.24	3	6	.5-1
Casco	5-12	18-30	1.55-1.65	0.6-2.0	0.12-0.19	5.6-7.8	Moderate-----	0.32			
	12-60	0-2	1.30-2.20	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
CdD, CdE, CdF----	0-4	10-17	1.35-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.32	3	5	1-2
Casco	4-15	18-30	1.55-1.65	0.6-2.0	0.12-0.19	5.6-7.8	Moderate-----	0.32			
	15-60	0-2	1.30-2.20	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
CnB2, CnC2-------	0-7	15-25	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	4-3	6	1-3
Cincinnati	7-30	22-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-5.5	Low-----------	0.37			
	30-46	24-35	1.60-1.85	0.06-0.2	0.08-0.12	4.5-6.5	Moderate-----	0.37			
	46-70	24-40	1.55-1.75	0.06-0.2	0.08-0.12	4.5-7.3	Moderate-----	0.37			
	70-86	24-40	1.55-1.75	0.06-0.2	0.08-0.12	6.1-7.8	Moderate-----	0.37			
DaB---------------	0-14	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.32	5	5	3-5
Dana	14-30	27-35	1.45-1.65	0.6-2.0	0.18-0.20	5.1-6.0	Moderate-----	0.43			
	30-44	27-35	1.45-1.65	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.43			
	44-60	15-27	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Low-----------	0.43			
EcB2, EcC2, EcD, EcE--------------	0-5	27-50	1.35-1.55	0.06-0.6	0.12-0.18	5.1-8.4	Moderate-----	0.43	3	7	.5-3
Eden	5-28	40-60	1.45-1.65	0.06-0.2	0.08-0.13	5.1-8.4	Moderate-----	0.28			
	28-60	---	---	---	---	---	-------------	0.17			
EdF---------------	0-5	27-60	1.45-1.65	0.06-0.6	0.11-0.17	5.1-8.4	Moderate-----	0.28	3	7	.5-3
Eden	5-21	40-60	1.45-1.65	0.06-0.2	0.08-0.13	5.1-8.4	Moderate-----	0.28			
	21-30	---	---	---	---	---	-------------	0.17			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
EeB*, EeC*, EeD*:											
Eden------------	0-5	27-50	1.35-1.55	0.06-0.6	0.12-0.18	5.1-8.4	Moderate-----	0.43	3	7	.5-3
	5-28	40-60	1.45-1.65	0.06-0.2	0.08-0.13	5.1-8.4	Moderate-----	0.28			
	28-60	---	---	---	---	---	-------------	0.17			
Urban land.											
EpA, EpB2, EpC2-- Eldean	0-7	15-25	1.30-1.50	0.6-2.0	0.18-0.22	5.6-7.3	Low----------	0.37	4	5	1-3
	7-36	35-48	1.40-1.60	0.2-2.0	0.08-0.14	5.6-7.8	Moderate-----	0.37			
	36-60	2-8	---	>6.0	0.01-0.04	7.4-8.4	Low----------	0.10			
ErA*, ErB*:											
Eldean----------	0-7	15-25	1.30-1.50	0.6-2.0	0.18-0.22	5.6-7.3	Low----------	0.37	4	5	1-3
	7-36	35-48	1.40-1.60	0.2-2.0	0.08-0.14	5.6-7.8	Moderate-----	0.37			
	36-60	2-8	---	>6.0	0.01-0.04	7.4-8.4	Low----------	0.10			
Urban land.											
FdA-------------- Fincastle	0-8	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.37	5	5	1-3
	8-33	20-35	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.37			
	33-42	20-35	1.45-1.65	0.2-0.6	0.15-0.19	5.1-7.8	Moderate-----	0.37			
	42-70	20-30	1.55-1.90	0.06-0.2	0.05-0.19	7.4-8.4	Low----------	0.37			
FeA*:											
Fincastle-------	0-8	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.37	5	5	1-3
	8-33	20-35	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.37			
	33-42	20-35	1.45-1.65	0.2-0.6	0.15-0.19	5.1-7.8	Moderate-----	0.37			
	42-70	20-30	1.55-1.90	0.06-0.2	0.05-0.19	7.4-8.4	Low----------	0.37			
Urban land.											
FoA, FoB2-------- Fox	0-8	10-17	1.35-1.55	0.6-2.0	0.17-0.23	5.1-7.3	Low----------	0.32	4	5	1-3
	8-34	25-35	1.55-1.65	0.6-2.0	0.10-0.16	5.6-8.4	Moderate-----	0.32			
	34-60	0-2	1.30-2.20	>6.0	0.02-0.04	7.4-8.4	Low----------	0.10			
FpA*:											
Fox-------------	0-8	10-17	1.35-1.55	0.6-2.0	0.17-0.23	5.1-7.3	Low----------	0.32	4	5	1-3
	8-34	25-35	1.55-1.65	0.6-2.0	0.10-0.16	5.6-8.4	Moderate-----	0.32			
	34-60	0-2	1.30-2.20	>6.0	0.02-0.04	7.4-8.4	Low----------	0.10			
Urban land.											
Gn--------------- Genesee	0-9	18-27	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	5	1-3
	9-35	18-27	1.30-1.50	0.6-2.0	0.17-0.22	6.1-8.4	Low----------	0.37			
	35-60	10-20	1.30-1.50	0.6-2.0	0.19-0.21	7.4-8.4	Low----------	0.37			
Go*:											
Genesee---------	0-9	18-27	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	5	1-3
	9-35	18-27	1.30-1.50	0.6-2.0	0.17-0.22	6.1-8.4	Low----------	0.37			
	35-60	10-20	1.30-1.50	0.6-2.0	0.19-0.21	7.4-8.4	Low----------	0.37			
Urban land.											
HeF-------------- Hennepin	0-2	20-30	1.20-1.40	0.6-2.0	0.18-0.24	6.1-8.4	Low----------	0.32	4	5	1-2
	2-12	18-30	1.30-1.60	0.2-2.0	0.14-0.22	6.1-8.4	Low----------	0.32			
	12-60	18-30	1.45-1.70	0.06-0.6	0.07-0.11	6.1-8.4	Low----------	0.32			
HoA-------------- Henshaw	0-8	12-27	1.20-1.40	0.6-2.0	0.18-0.23	5.6-6.5	Low----------	0.43	4	6	.5-2
	8-44	18-34	1.20-1.40	0.2-0.6	0.15-0.19	5.1-7.3	Low----------	0.43			
	44-66	15-34	1.20-1.40	0.2-0.6	0.17-0.22	6.6-8.4	Low----------	0.43			
Hu--------------- Huntington	0-11	18-30	1.10-1.30	0.6-2.0	0.18-0.24	5.6-7.8	Low----------	0.32	5	6	3-6
	11-68	18-30	1.30-1.50	0.6-2.0	0.16-0.22	5.6-7.8	Low----------	0.32			
	68-80	15-27	1.30-1.50	0.6-2.0	0.10-0.16	5.6-7.8	Low----------	0.28			
Ju--------------- Jules	0-72	10-20	1.15-1.40	0.6-2.0	0.20-0.24	7.4-8.4	Low----------	0.37	5	5	1-2

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
Lg---------------- Lanier	0-17	5-14	1.20-1.50	2.0-20	0.11-0.16	6.6-8.4	Low-----------	0.20	5	3	.5-3
	17-72	1-8	---	>6.0	0.02-0.06	7.4-8.4	Low-----------	0.15			
MaB, MaC2, MaD2, MaE2------------ Markland	0-10	28-40	1.35-1.50	0.2-0.6	0.18-0.20	5.6-7.3	Moderate-----	0.43	2	7	1-3
	10-33	40-55	1.55-1.70	0.06-0.2	0.11-0.13	5.1-6.5	High---------	0.32			
	33-60	35-50	1.55-1.70	0.06-0.2	0.09-0.11	7.9-8.4	High---------	0.32			
McA, McB--------- Martinsville	0-9	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
	9-34	18-30	1.40-1.60	0.6-2.0	0.17-0.20	5.1-6.0	Moderate-----	0.37			
	34-44	10-25	1.40-1.60	0.6-2.0	0.12-0.14	5.6-6.5	Low-----------	0.24			
	44-60	3-23	1.50-1.70	0.6-2.0	0.19-0.21	6.6-8.4	Low-----------	0.24			
MnC2------------- Miamian	0-6	14-27	1.30-1.50	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	5	6	1-3
	6-24	35-48	1.45-1.70	0.2-0.6	0.12-0.18	4.5-7.8	Moderate-----	0.37			
	24-60	16-31	1.60-1.82	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37			
MoD2*, MoE2*: Miamian---------	0-6	14-27	1.30-1.50	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	5	6	1-3
	6-24	35-48	1.45-1.70	0.2-0.6	0.12-0.18	4.5-7.8	Moderate-----	0.37			
	24-60	16-31	1.60-1.82	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37			
Hennepin---------	0-2	20-30	1.20-1.40	0.6-2.0	0.18-0.24	6.1-7.8	Low-----------	0.32	4	5	1-2
	2-12	18-30	1.30-1.60	0.2-2.0	0.14-0.22	6.1-7.8	Low-----------	0.32			
	12-60	18-30	1.45-1.70	0.06-0.6	0.07-0.11	6.1-8.4	Low-----------	0.32			
MuC*: Miamian---------	0-6	14-27	1.30-1.50	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	5	6	1-3
	6-27	35-48	1.45-1.70	0.2-0.6	0.12-0.18	4.5-7.8	Moderate-----	0.37			
	27-60	16-31	1.60-1.82	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37			
Urban land.											
PbB2, PbC2, PbD, PbE------------- Parke	0-18	18-27	1.25-1.40	0.6-2.0	0.22-0.24	4.5-6.5	Low-----------	0.37	5-4	5	.5-2
	18-36	22-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-5.0	Moderate-----	0.37			
	36-90	20-30	1.55-1.65	0.6-2.0	0.16-0.18	4.5-5.5	Low-----------	0.28			
PcB*, PcC*: Parke-----------	0-18	18-27	1.25-1.40	0.6-2.0	0.22-0.24	4.5-6.5	Low-----------	0.37	5-4	5	.5-2
	18-36	22-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-5.0	Moderate-----	0.37			
	36-90	20-30	1.55-1.65	0.6-2.0	0.16-0.18	4.5-5.5	Low-----------	0.28			
Urban land.											
PfC, PfD, PfE---- Pate	0-10	28-40	1.40-1.60	0.2-0.6	0.21-0.23	5.6-7.3	Moderate-----	0.37	3	7	1-4
	10-37	35-55	1.50-1.70	<0.06	0.08-0.16	5.6-7.3	High---------	0.37			
	37-54	35-55	1.60-1.80	<0.06	0.05-0.12	6.1-8.4	High---------	0.37			
	54-60	---	---	---	---	---	-------------	----			
PhD*: Pate------------	0-10	28-40	1.40-1.60	0.2-0.6	0.21-0.23	5.6-7.3	Moderate-----	0.37	3	7	1-4
	10-37	35-55	1.50-1.70	<0.06	0.08-0.16	5.6-7.3	High---------	0.37			
	37-54	35-55	1.60-1.80	<0.06	0.05-0.12	6.1-8.4	High---------	0.37			
	54-72	---	---	---	---	---	-------------	----			
Urban land.											

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
Pn--------------- Patton	0-14	27-35	1.15-1.35	0.6-2.0	0.21-0.23	6.6-7.3	Moderate-----	0.28	5	7	3-5
	14-37	27-35	1.25-1.45	0.2-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.28			
	37-60	22-35	1.30-1.50	0.2-2.0	0.18-0.22	7.4-8.4	Moderate-----	0.28			
Po*. Pits											
PrA, PrB, PrC2--- Princeton	0-10	12-20	1.35-1.50	0.6-2.0	0.13-0.18	5.6-7.3	Low----------	0.24	5-4	3	.5-2
	10-40	18-25	1.40-1.55	0.6-2.0	0.14-0.18	5.1-6.5	Low----------	0.32			
	40-57	8-18	1.40-1.55	2.0-6.0	0.12-0.14	5.1-7.3	Low----------	0.32			
	57-75	4-10	1.45-1.60	2.0-6.0	0.06-0.08	6.1-8.4	Low----------	0.17			
RdA-------------- Raub	0-13	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	5	2-4
	13-38	27-35	1.50-1.70	0.2-0.6	0.18-0.20	5.1-6.5	Moderate-----	0.37			
	38-51	27-35	1.50-1.70	0.2-0.6	0.15-0.19	6.1-7.3	Moderate-----	0.37			
	51-60	20-32	1.50-1.70	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			
Rn--------------- Ross	0-16	15-27	1.20-1.45	0.6-2.0	0.19-0.24	6.1-7.8	Low----------	0.32	5	5	3-5
	16-37	18-32	1.20-1.50	0.6-2.0	0.16-0.22	6.1-8.4	Low----------	0.32			
	37-60	5-25	1.35-1.60	0.6-6.0	0.05-0.18	6.1-8.4	Low----------	0.32			
RpA, RpB2, RpC2-- Rossmoyne	0-12	13-27	1.35-1.50	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.37	4	6	1-3
	12-26	22-35	1.40-1.60	0.6-2.0	0.14-0.19	4.5-5.5	Moderate-----	0.37			
	26-49	24-35	1.70-1.90	0.06-0.2	0.06-0.10	4.5-5.5	Moderate-----	0.37			
	49-92	18-45	1.60-1.75	0.06-0.2	0.06-0.10	5.6-8.4	Moderate-----	0.37			
RtA*, RtB*, RtC*:											
Rossmoyne-------	0-12	13-27	1.35-1.50	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.37	4	6	1-3
	12-26	22-35	1.40-1.60	0.6-2.0	0.14-0.19	4.5-5.5	Moderate-----	0.37			
	26-49	24-35	1.70-1.90	0.06-0.2	0.06-0.10	4.5-5.5	Moderate-----	0.37			
	49-92	18-45	1.60-1.75	0.06-0.2	0.06-0.10	5.6-8.4	Moderate-----	0.37			
Urban land.											
RwB2------------- Russell	0-7	11-25	1.30-1.45	0.6-2.0	0.21-0.24	5.6-7.3	Low----------	0.37	5	5	.5-2
	7-22	25-33	1.40-1.60	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	22-43	23-33	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	43-72	14-30	1.60-1.80	0.6-2.0	0.05-0.19	7.4-8.4	Low----------	0.37			
RxB*:											
Russell---------	0-7	11-25	1.30-1.45	0.6-2.0	0.21-0.24	5.6-7.3	Low----------	0.37	5	5	.5-2
	7-22	25-33	1.40-1.60	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	22-43	23-33	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	43-72	14-30	1.60-1.80	0.6-2.0	0.05-0.19	7.4-8.4	Low----------	0.37			
Urban land.											
St--------------- Stonelick	0-10	8-18	1.25-1.50	2.0-6.0	0.09-0.14	7.4-8.4	Low----------	0.24	5	3	.5-2
	10-72	5-18	1.20-1.55	2.0-6.0	0.05-0.11	7.4-8.4	Low----------	0.24			
SwB2, SwC2, SwD2- Switzerland	0-6	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	4	5	.5-3
	6-24	25-35	1.40-1.65	0.6-2.0	0.18-0.22	4.5-6.0	Moderate-----	0.43			
	24-64	55-70	1.35-1.60	<0.06	0.09-0.13	4.5-8.4	High---------	0.32			
	64-99	---	---	<0.06	0.05-0.09	7.4-8.4	High---------	----			
SxB*, SxC*:											
Switzerland-----	0-6	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.43	4	5	.5-3
	6-24	25-35	1.40-1.65	0.6-2.0	0.18-0.22	4.5-6.0	Moderate-----	0.43			
	24-64	55-70	1.35-1.60	<0.06	0.09-0.13	4.5-8.4	High---------	0.32			
Urban land.											
Ud*, Uf*. Udorthents											

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
UgB*, UgC*:											
Urban land.											
Elkinsville-----	0-11	15-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	.5-2
	11-45	22-30	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.0	Moderate-----	0.37			
	45-60	16-30	1.45-1.65	0.6-2.0	0.15-0.20	4.5-5.5	Moderate-----	0.37			
	60-80	20-34	1.40-1.60	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
Uh*:											
Urban land.											
Huntington------	0-11	18-30	1.10-1.30	0.6-2.0	0.18-0.24	5.6-7.8	Low----------	0.32	5	6	3-6
	11-68	18-30	1.30-1.50	0.6-2.0	0.16-0.22	5.6-7.8	Low----------	0.32			
	68-80	15-27	1.30-1.50	0.6-2.0	0.10-0.16	5.6-7.8	Low----------	0.28			
UmB*, UmC*:											
Urban land.											
Martinsville----	0-9	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	9-34	18-30	1.40-1.60	0.6-2.0	0.17-0.20	5.1-6.0	Moderate-----	0.37			
	34-44	10-25	1.40-1.60	0.6-2.0	0.12-0.14	5.6-6.5	Low----------	0.24			
	44-60	3-23	1.50-1.70	0.6-2.0	0.19-0.21	6.6-8.4	Low----------	0.24			
Uo*:											
Urban land.											
Patton----------	0-14	27-35	1.15-1.35	0.6-2.0	0.21-0.23	6.6-7.3	Moderate-----	0.28	5	7	3-5
	14-37	27-35	1.25-1.45	0.2-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.28			
	37-60	22-35	1.30-1.50	0.2-2.0	0.18-0.22	7.4-8.4	Moderate-----	0.28			
UrB*:											
Urban land.											
Rossmoyne-------	0-12	13-27	1.35-1.50	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.37	4	6	1-3
	12-26	22-35	1.40-1.60	0.6-2.0	0.14-0.19	4.5-5.5	Moderate-----	0.37			
	26-49	24-35	1.70-1.90	0.06-0.2	0.06-0.10	4.5-5.5	Moderate-----	0.37			
	49-92	18-45	1.60-1.75	0.06-0.2	0.06-0.10	5.6-8.4	Moderate-----	0.37			
Ux*:											
Urban land.											
Stonelick-------	0-10	8-18	1.25-1.50	2.0-6.0	0.09-0.14	7.4-8.4	Low----------	0.24	5	3	.5-2
	10-72	5-18	1.20-1.55	2.0-6.0	0.05-0.11	7.4-8.4	Low----------	0.24			
Wa--------------- Wakeland	0-8	10-17	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	8-60	10-17	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
WbA-------------- Warsaw Variant	0-14	7-17	1.35-1.60	0.6-2.0	0.14-0.22	6.1-6.5	Low----------	0.20	4	3	2-5
	14-31	7-17	1.35-1.65	0.6-2.0	0.10-0.16	5.6-7.3	Low----------	0.20			
	31-60	2-8	1.40-1.65	>20	0.02-0.04	7.9-8.4	Low----------	0.10			
WeA-------------- Wea	0-15	18-27	1.30-1.45	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.32	5	5	2-5
	15-30	20-35	1.40-1.60	0.6-2.0	0.15-0.20	5.1-6.5	Moderate-----	0.43			
	30-59	15-25	1.35-1.50	0.6-2.0	0.10-0.12	6.1-8.4	Low----------	0.24			
	59-70	1-7	1.50-1.75	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
WhA-------------- Whitaker	0-9	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	9-45	18-30	1.40-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.37			
	45-60	3-18	1.50-1.70	0.6-6.0	0.19-0.21	6.6-8.4	Low----------	0.37			
XfA, XfB2-------- Xenia	0-9	11-22	1.40-1.55	0.6-2.0	0.22-0.24	6.6-7.3	Low----------	0.37	5	5	1-3
	9-26	27-35	1.45-1.65	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.37			
	26-46	27-35	1.45-1.65	0.2-0.6	0.15-0.19	5.1-7.8	Moderate-----	0.37			
	46-72	20-27	1.55-1.90	0.2-2.0	0.05-0.19	7.9-8.4	Low----------	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
ArA, ArB2, ArC2--- Ava	C	None---------	---	---	2.0-4.0	Perched	Mar-Jun	>60	---	High-----	Moderate	High.
AsB*, AsC*:												
Ava---------------	C	None---------	---	---	2.0-4.0	Perched	Mar-Jun	>60	---	High-----	Moderate	High.
Urban land.												
AvA--------------- Avonburg	D	None---------	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
AwA*:												
Avonburg----------	D	None---------	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
Urban land.												
BoD, BoE, BoF----- Bonnell	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
CcC2, CdD, CdE, CdF--------------- Casco	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
CnB2, CnC2-------- Cincinnati	C	None---------	---	---	>4.0	Perched	Jan-Apr	>60	---	High-----	Moderate	High.
DaB--------------- Dana	B	None---------	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	High-----	Moderate	Moderate.
EcB2, EcC2, EcD, EcE, EdF--------- Eden	C	None---------	---	---	>6.0	---	---	20-40	Soft	High-----	Moderate	Low.
EeB*, EeC*, EeD*:												
Eden--------------	C	None---------	---	---	>6.0	---	---	20-40	Soft	High-----	Moderate	Low.
Urban land.												
EpA, EpB2, EpC2--- Eldean	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
ErA*, ErB*:												
Eldean------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Urban land.												
FdA--------------- Fincastle	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.

See footnotes at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
FeA*:												
Fincastle--------	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Urban land.												
FoA, FoB2--------- Fox	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
FpA*:												
Fox--------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Urban land.												
Gn---------------- Genesee	B	Occasional	Brief-----	Oct-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
Go*:												
Genesee----------	B	Occasional	Brief-----	Oct-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
Urban land.												
HeF--------------- Hennepin	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
HoA--------------- Henshaw	C	None--------	---	---	1.0-2.0	Apparent	Nov-Mar	>60	---	High-----	High-----	Moderate.
Hu---------------- Huntington	B	Occasional	Brief-----	Dec-May	4.0-6.0	Apparent	Dec-Apr	>60	---	High-----	Low------	Moderate.
Ju---------------- Jules	B	Occasional	Brief-----	Mar-Jun	>6.0	---	---	>60	---	High-----	Low------	Low.
Lg---------------- Lanier	A	Occasional	Brief-----	Nov-Jun	>6.0	---	---	>60	---	Low------	Low------	Low.
MaB, MaC2, MaD2, MaE2------------- Markland	C	None--------	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	Moderate	High-----	Moderate.
McA, McB---------- Martinsville	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MnC2-------------- Miamian	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MoD2*, MoE2*:												
Miamian----------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Hennepin---------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
MuC*:												
Miamian----------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.

See footnotes at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
MuC*:												
Urban land.												
PbB2, PbC2, PbD, PbE-------------- Parke	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
PcB*, PcC*:												
Parke------------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Urban land.												
PfC, PfD, PfE----- Pate	C	None--------	---	---	>6.0	---	---	>50	Soft	Moderate	High-----	Moderate.
PhD*:												
Pate-------------	C	None--------	---	---	>6.0	---	---	>50	Soft	Moderate	High-----	Moderate.
Urban land.												
Pn**-------------- Patton	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
Po*. Pits												
PrA, PrB, PrC2---- Princeton	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
RdA--------------- Raub	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Rn---------------- Ross	B	Rare--------	---	---	4.0-6.0	Apparent	Feb-Apr	>60	---	Moderate	Low------	Low.
RpA, RpB2, RpC2--- Rossmoyne	C	None--------	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
RtA*, RtB*, RtC*:												
Rossmoyne--------	C	None--------	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
Urban land.												
RwB2-------------- Russell	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
RxB*:												
Russell----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
Urban land.												
St---------------- Stonelick	B	Frequent----	Very brief	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.

See footnotes at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
SwB2, SwC2, SwD2-- Switzerland	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
SxB*, SxC*: Switzerland------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Urban land.												
Ud*, Uf*. Udorthents												
UgB*, UgC*: Urban land.												
Elkinsville------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
Uh*: Urban land.												
Huntington-------	B	Frequent----	Brief-----	Dec-May	4.0-6.0	Apparent	Dec-Apr	>60	---	High-----	Low------	Moderate.
UmB*, UmC*: Urban land.												
Martinsville-----	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Uo*: Urban land.												
Patton**---------	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
UrB*: Urban land.												
Rossmoyne--------	C	None--------	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
Ux*: Urban land.												
Stonelick--------	B	Frequent----	Very brief	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
Wa--------------- Wakeland	B/D	Occasional	Brief-----	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
WbA-------------- Warsaw Variant	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
WeA-------------- Wea	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
WhA-------------- Whitaker	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.

See footnotes at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
XfA, XfB2--------- Xenia	B	None---------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.
** The plus sign preceding the range in depth to the water table means that the range in this soil is from .5 foot above the surface to 2.0 feet below.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
*Ava	Fine-silty, mixed, mesic Typic Fragiudalfs
Avonburg	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Bonnell	Fine, mixed, mesic Typic Hapludalfs
Casco	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Cincinnati	Fine-silty, mixed, mesic Typic Fragiudalfs
Dana	Fine-silty, mixed, mesic Typic Argiudolls
Eden	Fine, mixed, mesic Typic Hapludalfs
Eldean	Fine, mixed, mesic Typic Hapludalfs
Elkinsville	Fine-silty, mixed, mesic Ultic Hapludalfs
Fincastle	Fine-silty, mixed, mesic Aeric Ochraqualfs
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Genesee	Fine-loamy, mixed, nonacid, mesic Typic Udifluvents
Hennepin	Fine-loamy, mixed, mesic Typic Eutrochrepts
Henshaw	Fine-silty, mixed, mesic Aquic Hapludalfs
Huntington	Fine-silty, mixed, mesic Fluventic Hapludolls
Jules	Coarse-silty, mixed (calcareous), mesic Typic Udifluvents
Lanier	Sandy-skeletal, mixed, mesic Fluventic Hapludolls
Markland	Fine, mixed, mesic Typic Hapludalfs
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Miamian	Fine, mixed, mesic Typic Hapludalfs
Parke	Fine-silty, mixed, mesic Ultic Hapludalfs
Pate	Fine, illitic, mesic Typic Hapludalfs
Patton	Fine-silty, mixed, mesic Typic Haplaquolls
Princeton	Fine-loamy, mixed, mesic Typic Hapludalfs
Raub	Fine-silty, mixed, mesic Aquic Argiudolls
Ross	Fine-loamy, mixed, mesic Cumulic Hapludolls
Rossmoyne	Fine-silty, mixed, mesic Aquic Fragiudalfs
Russell	Fine-silty, mixed, mesic Typic Hapludalfs
Stonelick	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Switzerland	Fine-silty over clayey, mixed, mesic Typic Hapludalfs
Udorthents, clayey	Clayey, mixed, nonacid, mesic Typic Udorthents
Udorthents, loamy	Loamy, mixed, nonacid, mesic Typic Udorthents
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Warsaw Variant	Coarse-loamy, mixed, mesic Cumulic Hapludolls
Wea	Fine-loamy, mixed, mesic Typic Argiudolls
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Xenia	Fine-silty, mixed, mesic Aquic Hapludalfs

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF LANDS AND SOIL
OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

GENERAL SOIL MAP
HAMILTON COUNTY, OHIO

Scale 1:190,080

SOIL LEGEND

STRONGLY SLOPING TO VERY STEEP SOILS; ON UPLANDS

1 — Eden-Pate association: Moderately deep and deep, strongly sloping to very steep, well drained and moderately well drained moderately fine textured soils; on uplands

NEARLY LEVEL TO VERY STEEP SOILS, AND URBAN LAND; ON UPLANDS

2 — Bonnell-Rossmoyne-Cincinnati association: Deep, gently sloping to very steep, well drained and moderately well drained medium textured soils; on uplands

3 — Rossmoyne-Urban land-Switzerland association: Deep, nearly level to moderately steep, moderately well drained and well drained medium textured soils, and Urban land; on uplands

4 — Ava-Urban land-Switzerland association: Deep, nearly level to strongly sloping, moderately well drained and well drained medium textured soils, and Urban land; on uplands

5 — Russell-Urban land-Xenia association: Deep, nearly level and gently sloping, well drained and moderately well drained medium textured soils, and Urban land; on uplands

NEARLY LEVEL TO STRONGLY SLOPING SOILS, AND URBAN LAND; ON TERRACES AND OUTWASH PLAINS

6 — Urban land-Martinsville-Fox association: Urban land and deep, nearly level to strongly sloping, well drained medium textured soils; on stream terraces and outwash plains

7 — Eldean-Princeton association: Deep, nearly level to sloping, well drained medium textured and moderately coarse textured soils; on terraces and outwash plains

NEARLY LEVEL TO STEEP SOILS, AND URBAN LAND; ON LACUSTRINE TERRACES AND BASINS

8 — Markland-Urban land-Patton association: Deep, nearly level to steep, moderately well drained and poorly drained moderately fine textured soils, and Urban land; on lacustrine terraces and basins

GENTLY SLOPING TO STEEP SOILS; ON TERRACES

9 — Parke association: Deep, gently sloping to steep, well drained medium textured soils; on high terraces

NEARLY LEVEL SOILS, AND URBAN LAND; ON FLOOD PLAINS

10 — Jules-Stonelick association: Deep, nearly level, well drained medium textured and moderately coarse textured soils; on flood plains

11 — Genesee-Stonelick-Urban land association: Deep, nearly level, well drained medium textured and moderately coarse textured soils, and Urban land; on flood plains

URBAN LAND AND NEARLY LEVEL TO STRONGLY SLOPING SOILS; ON FLOOD PLAINS AND TERRACES

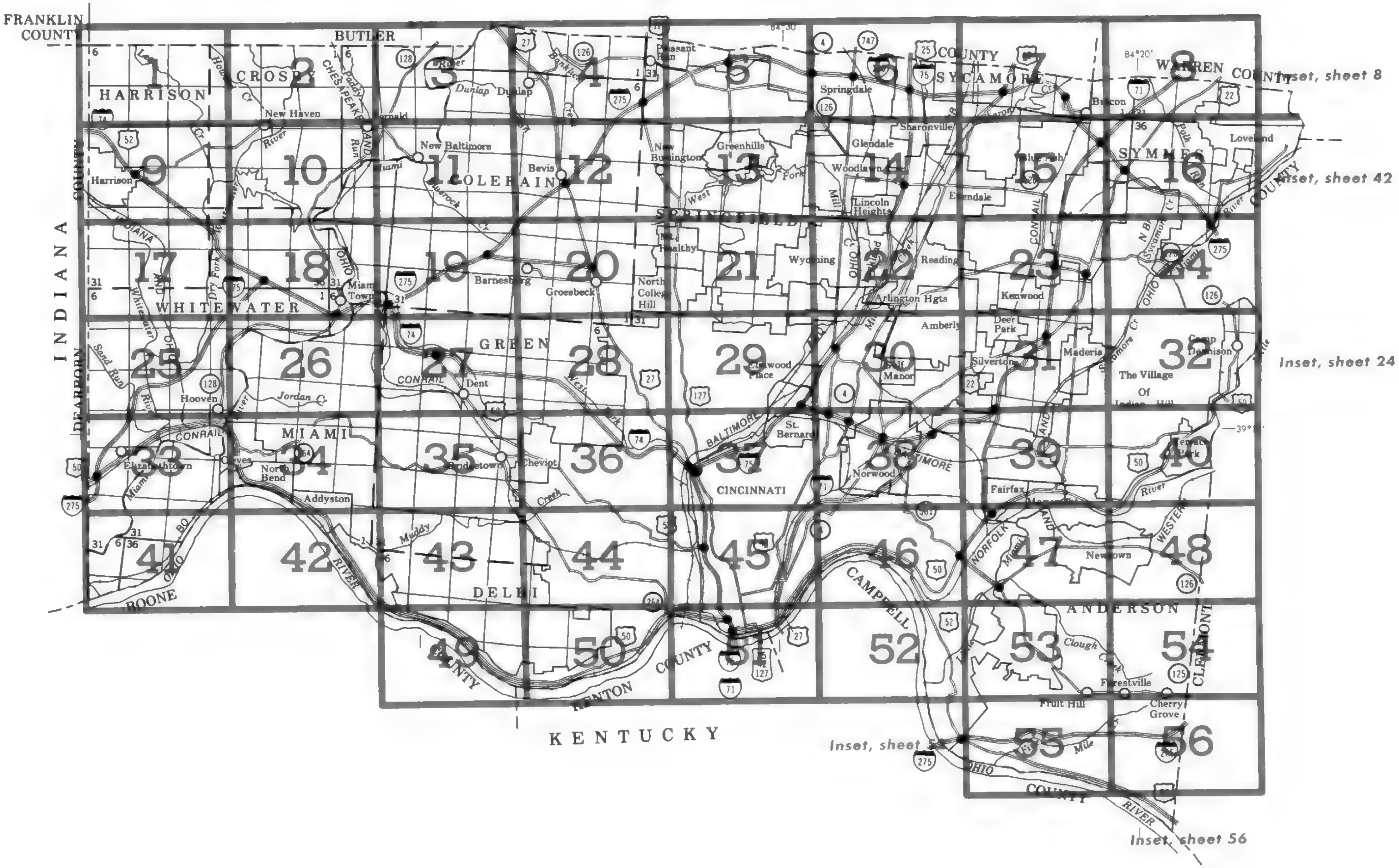
12 — Urban land-Huntington-Elkinsville association: Urban land and deep, nearly level to strongly sloping, well drained medium textured soils; on flood plains and terraces

Compiled 1981

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



N

INDEX TO MAP SHEETS
HAMILTON COUNTY, OHIO

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and a number. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 indicates that the soil is eroded.

SYMBOL	NAME
ArA	Ava silt loam, 0 to 3 percent slopes
ArB2	Ava silt loam, 3 to 8 percent slopes, eroded
ArC2	Ava silt loam, 8 to 15 percent slopes, eroded
AsB	Ava-Urban land complex, 3 to 8 percent slopes
AsC	Ava-Urban land complex, 8 to 15 percent slopes
AvA	Avonburg silt loam, 0 to 2 percent slopes
AwA	Avonburg-Urban land complex, 0 to 2 percent slopes
BoD	Bonnell silt loam, 15 to 25 percent slopes
BoE	Bonnell silt loam, 25 to 35 percent slopes
BoF	Bonnell silt loam, 35 to 60 percent slopes
CcC2	Casco gravelly loam, 8 to 15 percent slopes, eroded
CdD	Casco loam, 15 to 25 percent slopes
CdE	Casco loam, 25 to 35 percent slopes
CdF	Casco loam, 35 to 70 percent slopes
CnB2	Cincinnati silt loam, 3 to 8 percent slopes, eroded
CnC2	Cincinnati silt loam, 8 to 15 percent slopes, eroded
DaB	Dana silt loam, 0 to 4 percent slopes
EcB2	Eden silty clay loam, 3 to 8 percent slopes, eroded
EcC2	Eden silty clay loam, 8 to 15 percent slopes, eroded
EcD	Eden silty clay loam, 15 to 25 percent slopes
EcE	Eden silty clay loam, 25 to 40 percent slopes
EdF	Eden flaggy silty clay loam, 40 to 60 percent slopes
EeB	Eden-Urban land complex, 3 to 8 percent slopes
EeC	Eden-Urban land complex, 8 to 15 percent slopes
EeD	Eden-Urban land complex, 15 to 25 percent slopes
EpA	Eldean loam, 0 to 2 percent slopes
EpB2	Eldean loam, 2 to 6 percent slopes, eroded
EpC2	Eldean loam, 6 to 12 percent slopes, eroded
ErA	Eldean-Urban land complex, 0 to 2 percent slopes
ErB	Eldean-Urban land complex, 2 to 6 percent slopes
FdA	Fincastle silt loam, 0 to 2 percent slopes
FeA	Fincastle-Urban land complex, 0 to 2 percent slopes
FoA	Fox loam, 0 to 2 percent slopes
FoB2	Fox loam, 2 to 6 percent slopes, eroded
FpA	Fox-Urban land complex, 0 to 3 percent slopes
Gn	Genesee loam, occasionally flooded
Go	Genesee-Urban land complex, occasionally flooded
HeF	Hennepin silt loam, 35 to 60 percent slopes
HoA	Henshaw silt loam, 0 to 2 percent slopes
Hu	Huntington silt loam, occasionally flooded
Ju	Jules silt loam, occasionally flooded
Lg	Lanier sandy loam, occasionally flooded
MaB	Markland silty clay loam, 2 to 6 percent slopes
MaC2	Markland silty clay loam, 6 to 12 percent slopes, eroded
MaD2	Markland silty clay loam, 12 to 18 percent slopes, eroded
MaE2	Markland silty clay loam, 18 to 25 percent slopes, eroded
McA	Martinsville silt loam, 0 to 2 percent slopes
McB	Martinsville silt loam, 2 to 6 percent slopes
MnC2	Miamian silt loam, 8 to 15 percent slopes, eroded
MoD2	Miamian-Hennepin silt loams, 15 to 25 percent slopes, eroded
MoE2	Miamian-Hennepin silt loams, 25 to 35 percent slopes, eroded
MuC	Miamian-Urban land complex, 8 to 15 percent slopes
PbB2	Parke silt loam, 3 to 8 percent slopes, eroded
PbC2	Parke silt loam, 8 to 15 percent slopes, eroded
PbD	Parke silt loam, 15 to 25 percent slopes
PbE	Parke silt loam, 25 to 35 percent slopes
PcB	Parke-Urban land complex, 3 to 8 percent slopes
PcC	Parke-Urban land complex, 8 to 15 percent slopes
PfC	Pate silty clay loam, 8 to 15 percent slopes
PfD	Pate silty clay loam, 15 to 25 percent slopes
PfE	Pate silty clay loam, 25 to 35 percent slopes
PhD	Pate-Urban land complex, 15 to 25 percent slopes
Pn	Patton silty clay loam
Po	Pits, gravel
PrA	Princeton sandy loam, 0 to 2 percent slopes
PrB	Princeton sandy loam, 2 to 6 percent slopes
PrC2	Princeton sandy loam, 6 to 12 percent slopes, eroded
RdA	Raub silt loam, 0 to 2 percent slopes
Rn	Ross loam, rarely flooded
RpA	Rossmoyne silt loam, 0 to 3 percent slopes
RpB2	Rossmoyne silt loam, 3 to 8 percent slopes, eroded
RpC2	Rossmoyne silt loam, 8 to 15 percent slopes, eroded
RtA	Rossmoyne-Urban land complex, 0 to 3 percent slopes
RtB	Rossmoyne-Urban land complex, 3 to 8 percent slopes
RtC	Rossmoyne-Urban land complex, 8 to 15 percent slopes
RwB2	Russell silt loam, 3 to 8 percent slopes, eroded
RxB	Russell-Urban land complex, 3 to 8 percent slopes
St	Stonelick fine sandy loam, frequently flooded
SwB2	Switzerland silt loam, 3 to 8 percent slopes, eroded
SwC2	Switzerland silt loam, 8 to 15 percent slopes, eroded
SwD2	Switzerland silt loam, 15 to 25 percent slopes, eroded
SxB	Switzerland-Urban land complex, 3 to 8 percent slopes
SxC	Switzerland-Urban land complex, 8 to 15 percent slopes
Ud	Udorthents, clayey
Uf	Udorthents, loamy
UgB	Urban land-Ellinsville complex, 3 to 8 percent slopes
UgC	Urban land-Ellinsville complex, 8 to 15 percent slopes
Uh	Urban land-Huntington complex, frequently flooded
UmB	Urban land-Martinsville complex, 3 to 8 percent slopes
UmC	Urban land-Martinsville complex, 8 to 15 percent slopes
Uo	Urban land-Patton complex
UrB	Urban land-Rossmoyne complex, 0 to 8 percent slopes
Ux	Urban land-Stonelick complex, frequently flooded
Wa	Wakeland silt loam, occasionally flooded
WbA	Warsaw Variant sandy loam, 0 to 2 percent slopes
WeA	Wea silt loam, 0 to 2 percent slopes
WhA	Whitaker loam, 0 to 2 percent slopes
XfA	Xenia silt loam, 0 to 2 percent slopes
XfB2	Xenia silt loam, 2 to 6 percent slopes, eroded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool — Davis Airstrip; FLOOD POOL LINE

STATE COORDINATE TICK

ROAD EMBLEMS & DESIGNATIONS

- Interstate
- Federal
- State

RAILROAD

LEVEES

- Without road
- With road

DAMS

- Large (to scale)
- Medium or small

PITS

- Gravel pit

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

LAKES, PONDS AND RESERVOIRS

- Perennial

MISCELLANEOUS WATER FEATURES

- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — PbB2 FdA

ESCARPMENTS

- Bedrock (points down slope)

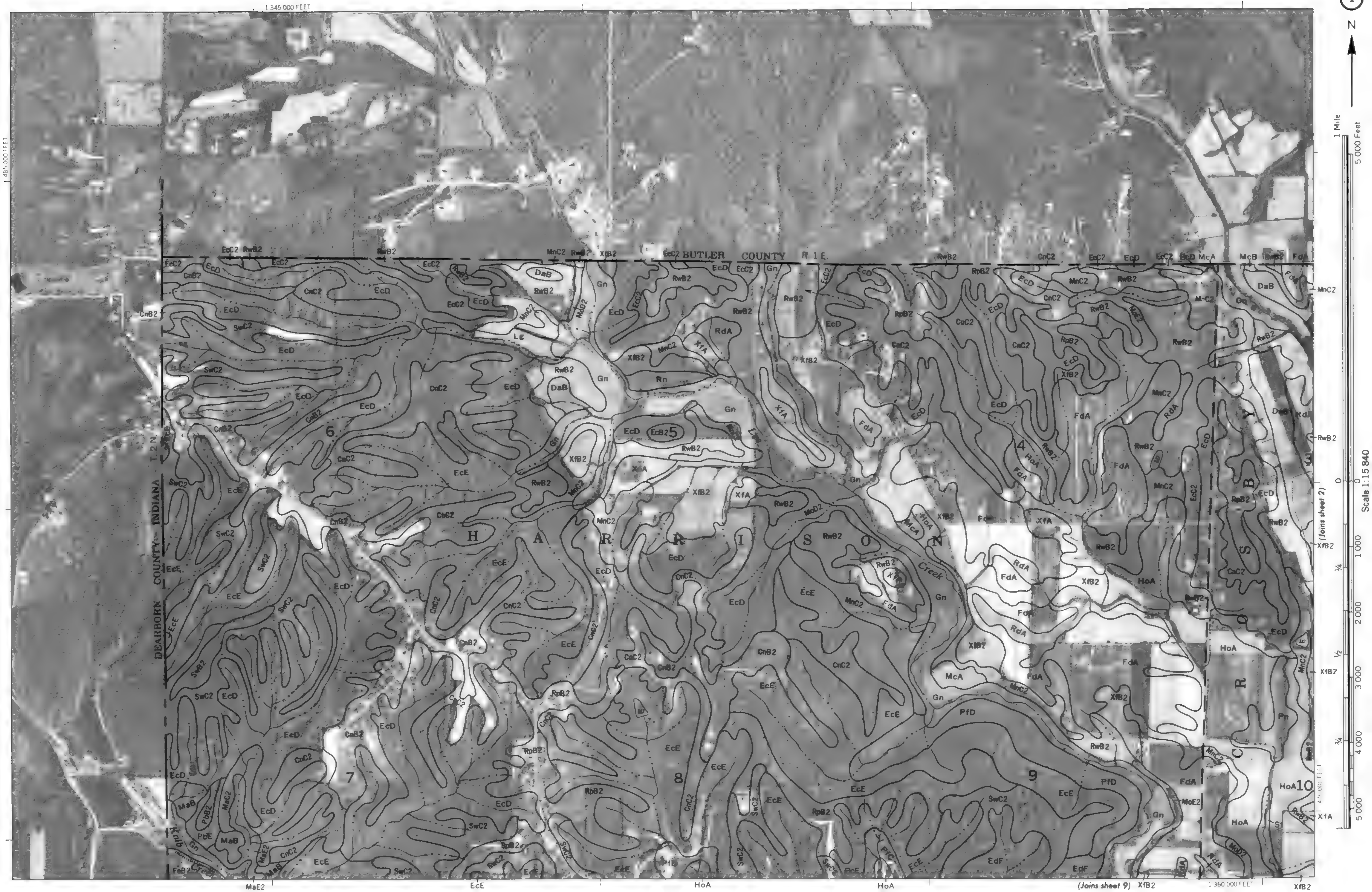
SHORT STEEP SLOPE

DEPRESSION OR SINK

SOIL SAMPLE SITE

MISCELLANEOUS

- Gravelly spot
- Dumps and other similar non soil areas
- Rock outcrop (includes sandstone and shale)
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)



HAMILTON COUNTY, OHIO NO. 1

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


N
Scale 1:15 840
1 Mile
5 000 Feet
R.1 E.
R.2 E.
BUTLER COUNTY
US RESERVATION
(ATOMIC ENERGY COMMISSION)
WHITEWATER
FORK
RIVER
C R O S B Y
New Haven
Paddys Run
T. 2 N.
(Joins sheet 1)
(Joins sheet 3)
(Joins sheet 10)
HAMILTON COUNTY, OHIO NO. 2


3
N
BUTLER COUNTY R. 2 E.
US RESERVATION
(ATOMIC ENERGY COMMISSION)
T 2 N
GREAT MIAMI RIVER
Dunlap Run
Dunlap
(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 11)
1 Mile
5 000 Feet
Scale 1:15 840
HAMILTON COUNTY, OHIO NO. 3


4
N
1 Mile
5 000 Feet
Scale 1:15 840
BUTLER COUNTY
R. 2 T. 2
C O L E R A I N
S P R I N G F I E L D
Banklick
Creek
Dunlap
Dunlap Run
Pleasant Run
Pleasant Run
CEMETERY
13
7
1
31
18
12
6
36
(Joins sheet 3)
(Joins sheet 5)
(Joins sheet 12)
R 1 T 3 R 2 1 2

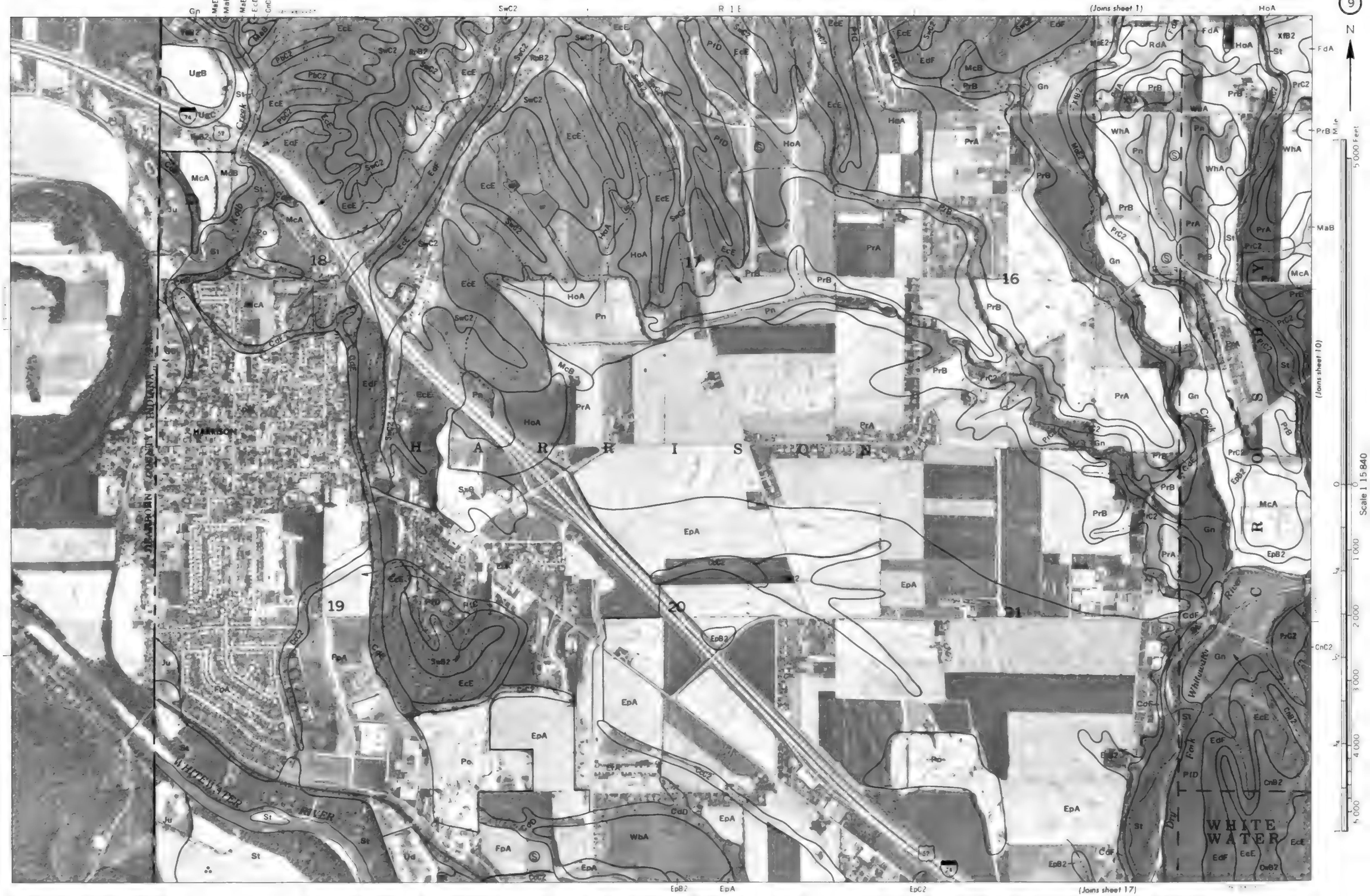

BUTLER COUNTY
R. 2 T. 2
SPRINGDALE
FOREST PARK
Springdale Lake
SPRINGFIELD
Pleasant Run
25
19
13
31
36
30
24
18
(Joins sheet 4)
(Joins sheet 6)
(Joins sheet 13)
R 1 T 3 R 2 T 2
N
1 Mile
5 000 Feet
Scale 1:15 840
RxB
MuC
XfB2
HeF
MnC2
MoD2
RdA
X1A
EcC2
EcD
RwB2
RtC
RtB
RpB2
BoD
DaB
Uo
Go
EeC
CnC2

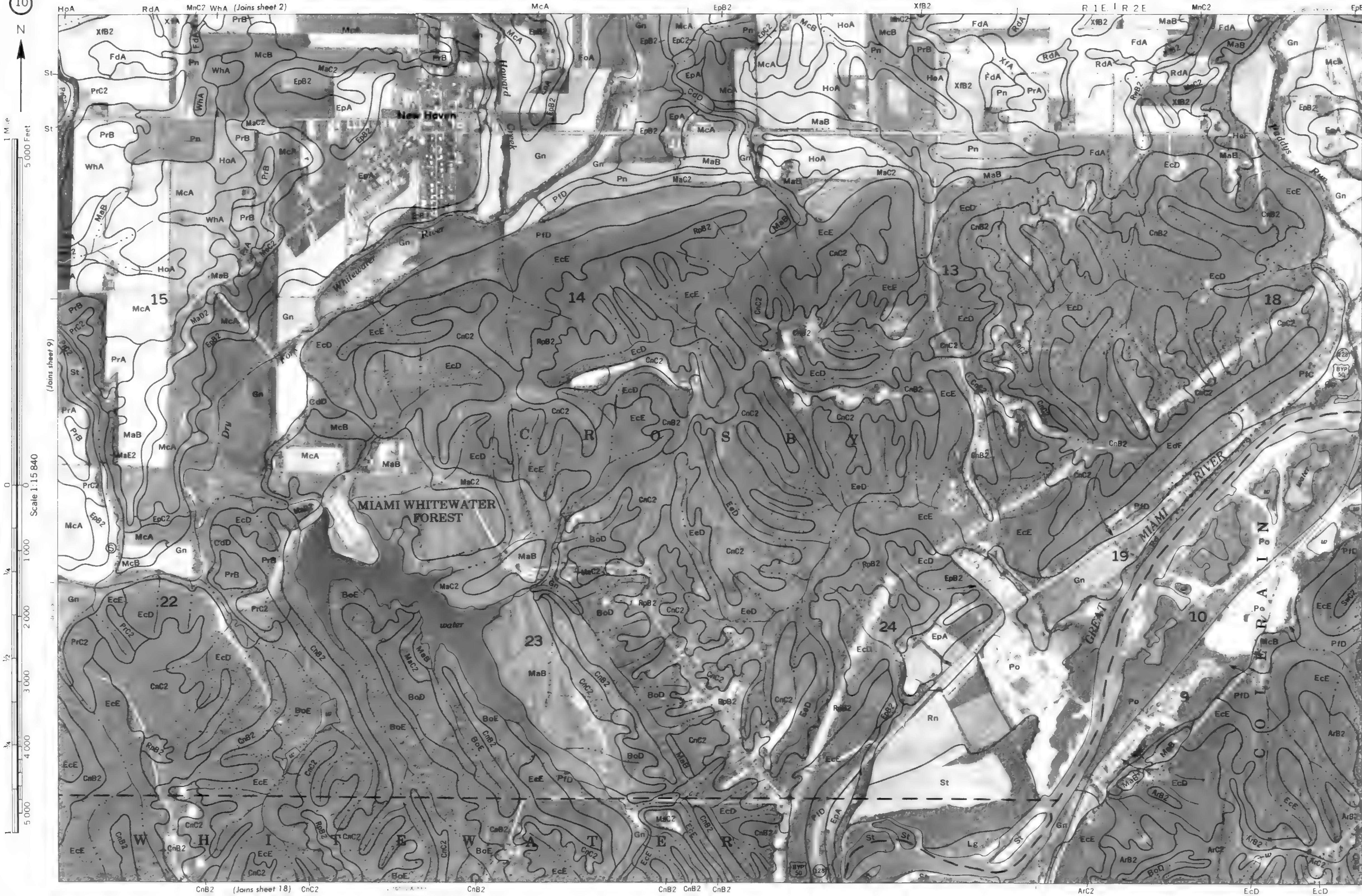
HAMILTON COUNTY, OHIO — SHEET NUMBER 6

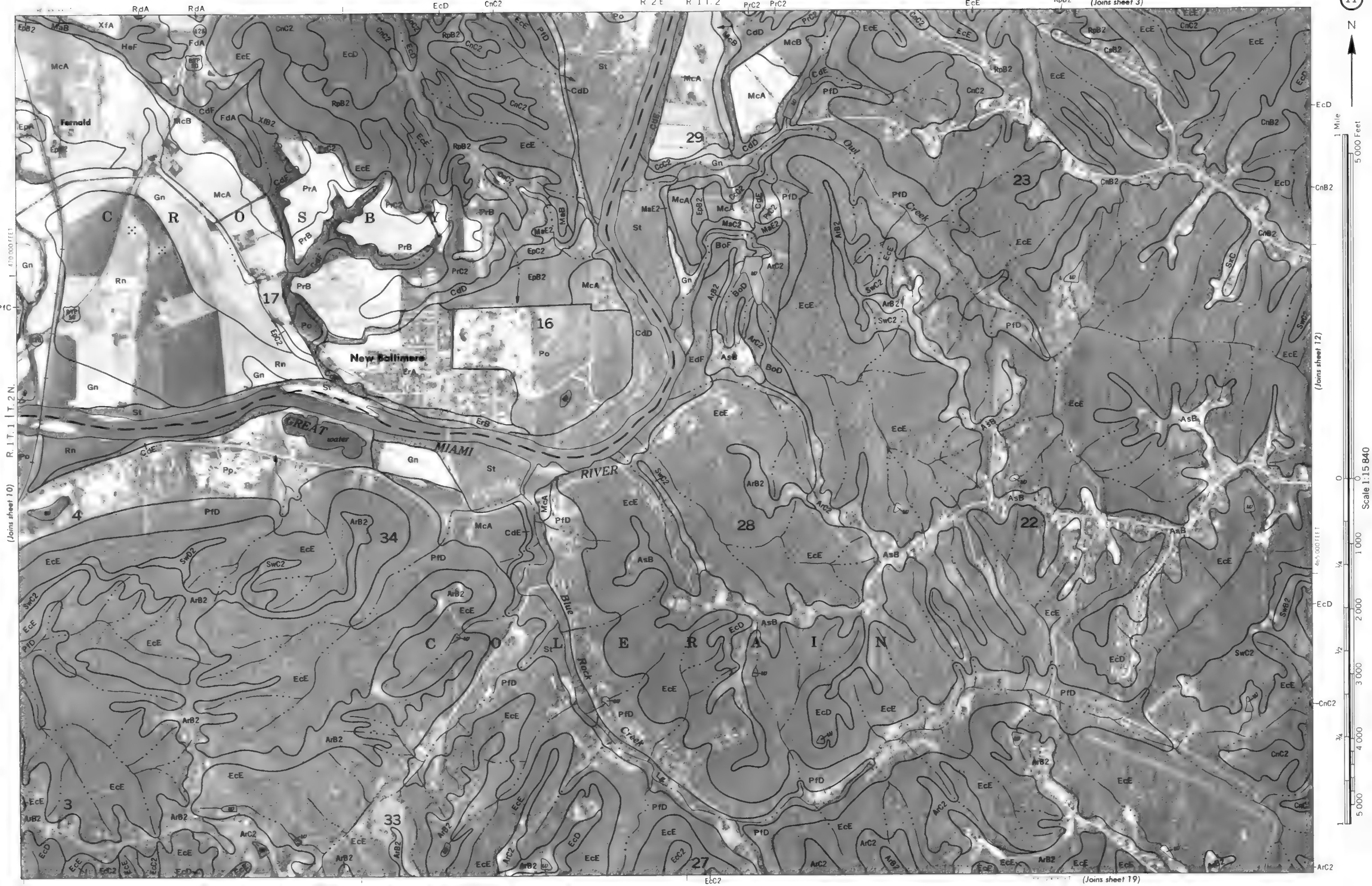
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 6)
(Joins sheet 8)
(Joins sheet 15)
BUTLER COUNTY
WARREN COUNTY
SYCAMORE
SHARONVILLE
SHARON WOODS
Sharon Lake
Sharon Creek
Highpoint
R 1 T 4 | R 2 T 3


N
Scale 1:15 840
1 Mile
5 000 Feet
(Joins sheet 7)
(Joins sheet 16)
(Joins inset)
(Joins lower right)
(Joins inset, sheet 42)
WARREN COUNTY
Loveland Park
LITTLE MIAMI RIVER
SYMMES
Sycamore
LOVELAND
Polk Run
13
31
25
19
R 2 T 3
R 2 T 4

HAMILTON COUNTY, OHIO NO. 9

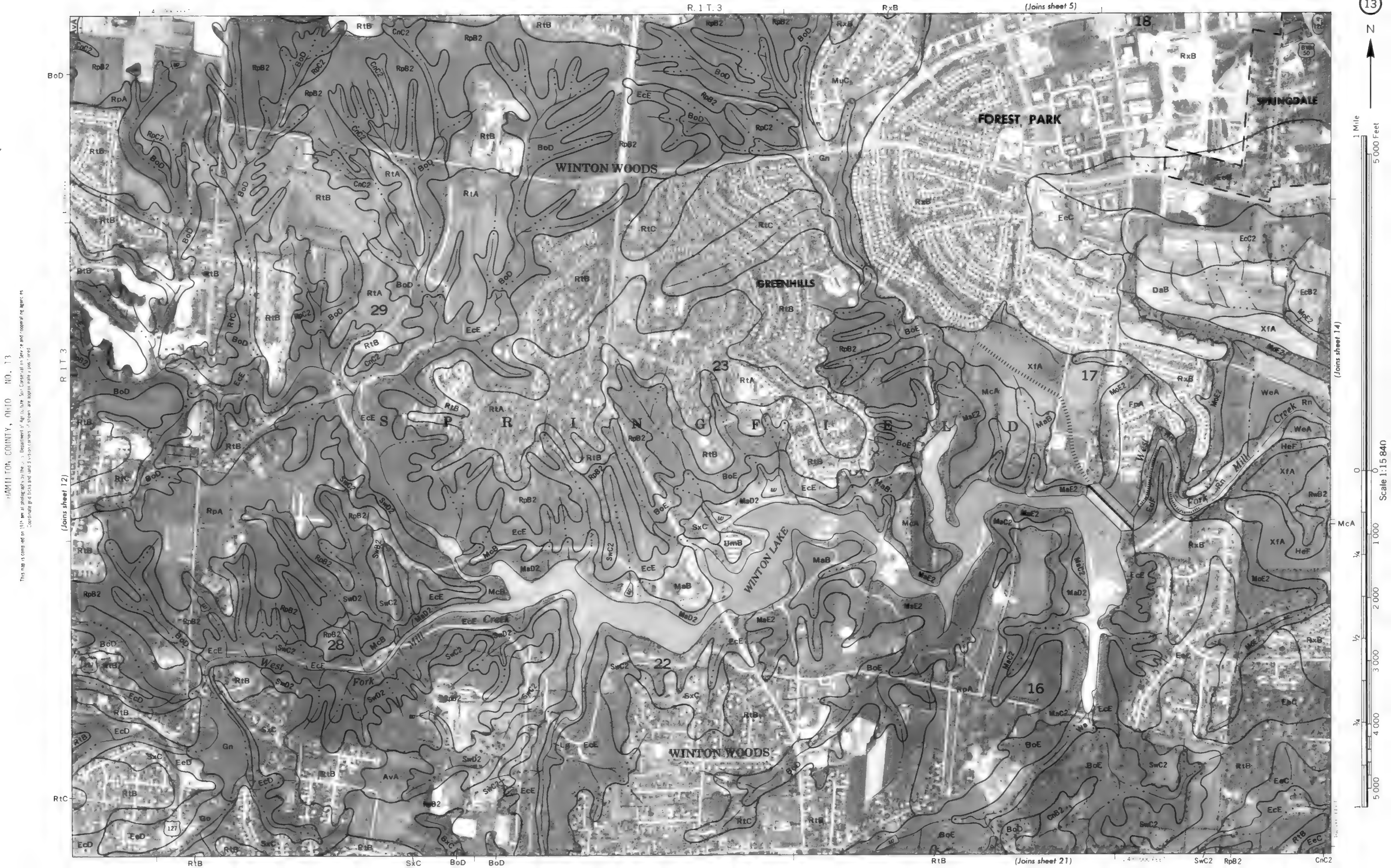



N
(Joins sheet 2)
(Joins sheet 9)
(Joins sheet 11)
(Joins sheet 18)
R 1 E | R 2 E
T 1 N | T 2 N
Scale 1:15 840
1 Mile
5 000 Feet
New Haven
Howard Creek
Whitewater River
Dry Fork
MIAMI WHITEWATER FOREST
water
C R O S B Y
W H I T E W A T E R
C O L E R A I N
GREAT MIAMI RIVER
Paddys Run
13
14
15
18
19
22
23
24
9
10



This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


(Joins sheet 4)
(Joins sheet 11)
(Joins sheet 13)
(Joins sheet 20)
R 1 T 2 | R 1 T 3
N
1 Mile
5 000 Feet
Scale 1:15 840
Dunlap Run
Lake Gloria
Dry Ridge
Bevis
Dornbush
New Burlington
NORTHBROOK
C O L E R A I N
S P R I N G F I E L D
Uf
17
16
11
10
5
4
35
34
EcE
EcD
CnB2
CnC2
RtB
RtC
BoD
RpB2
FdA
MoE2
XfB2
RxB
HoA
RpA
SwC2
SwB2
BoE



13
N
R. 1 T. 3
(Joins sheet 5)
(Joins sheet 14)
(Joins sheet 21)
(Joins sheet 12)
FOREST PARK
SPRINGDALE
GREENHILLS
WINTON WOODS
WINTON LAKE
S P R I N G F I E L D
West Fork Mill Creek
1 Mile
5 000 Feet
Scale 1:15 840

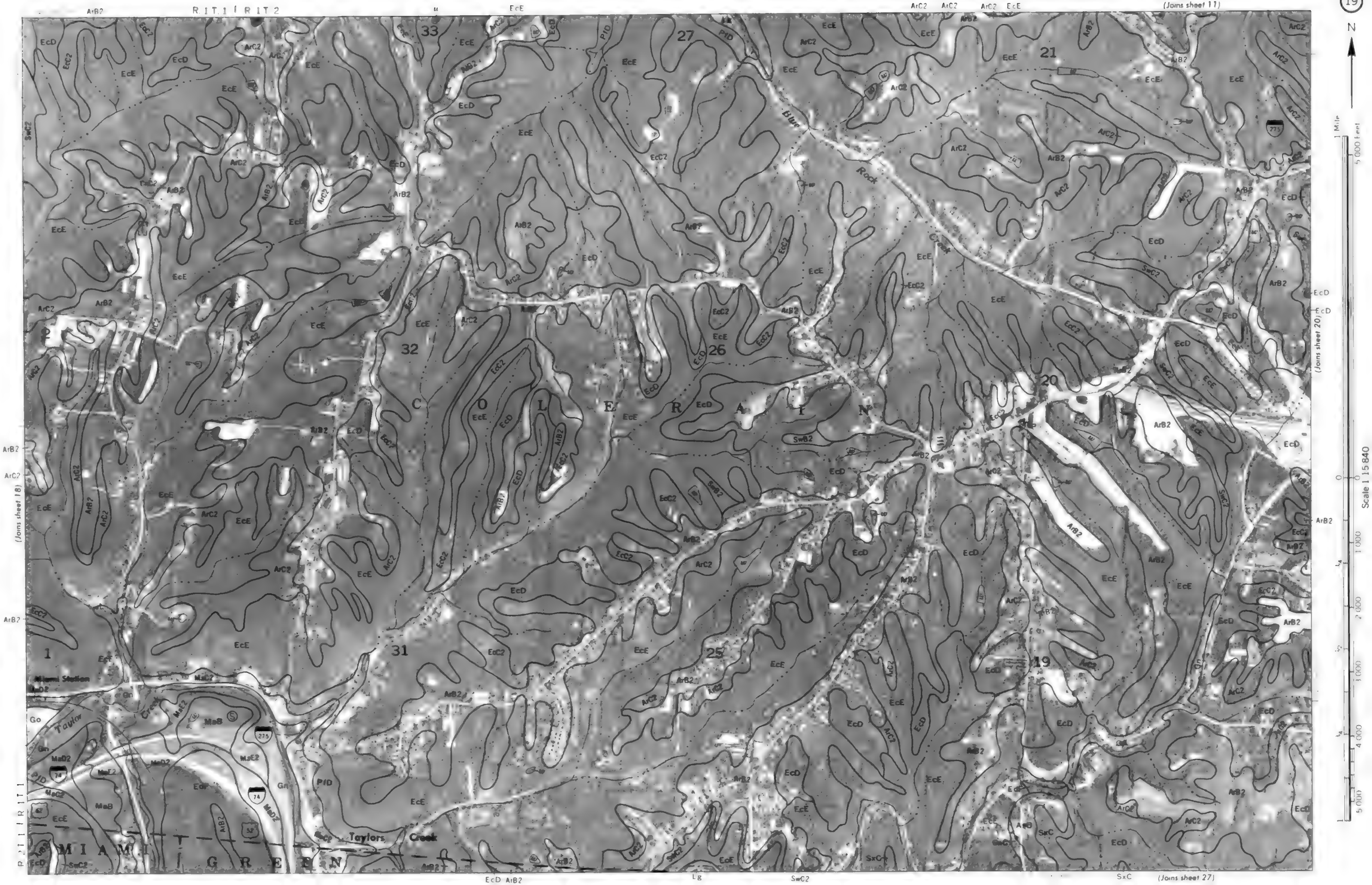

14
(Joins sheet 6)
(Joins sheet 13)
(Joins sheet 15)
(Joins sheet 22)
SPRINGDALE
GLENDALE
SHARONVILLE
SPRINGFIELD
Sycamore
LINCOLN HEIGHTS
Scale 1:15 840
Mill Creek
Sharon Creek
West Fork


15
N
(Joins sheet 7)
(Joins sheet 14)
(Joins sheet 16)
(Joins sheet 23)
R 1 T 4
SHARONVILLE
SHARON WOODS
Sharon Creek
BLUE ASH
Sycamore
Brecon
Carter Lake
Montgomery
Fairwind Acres
Cincinnati Incorporated Airport
CEMETERY
Sycamore Creek
North Branch
water
24
18
12
23
17
11
5
SYCAMORE
1 Mile
5 000 Feet
Scale 1:15 840
HAMILTON COUNTY, OHIO NO. 15

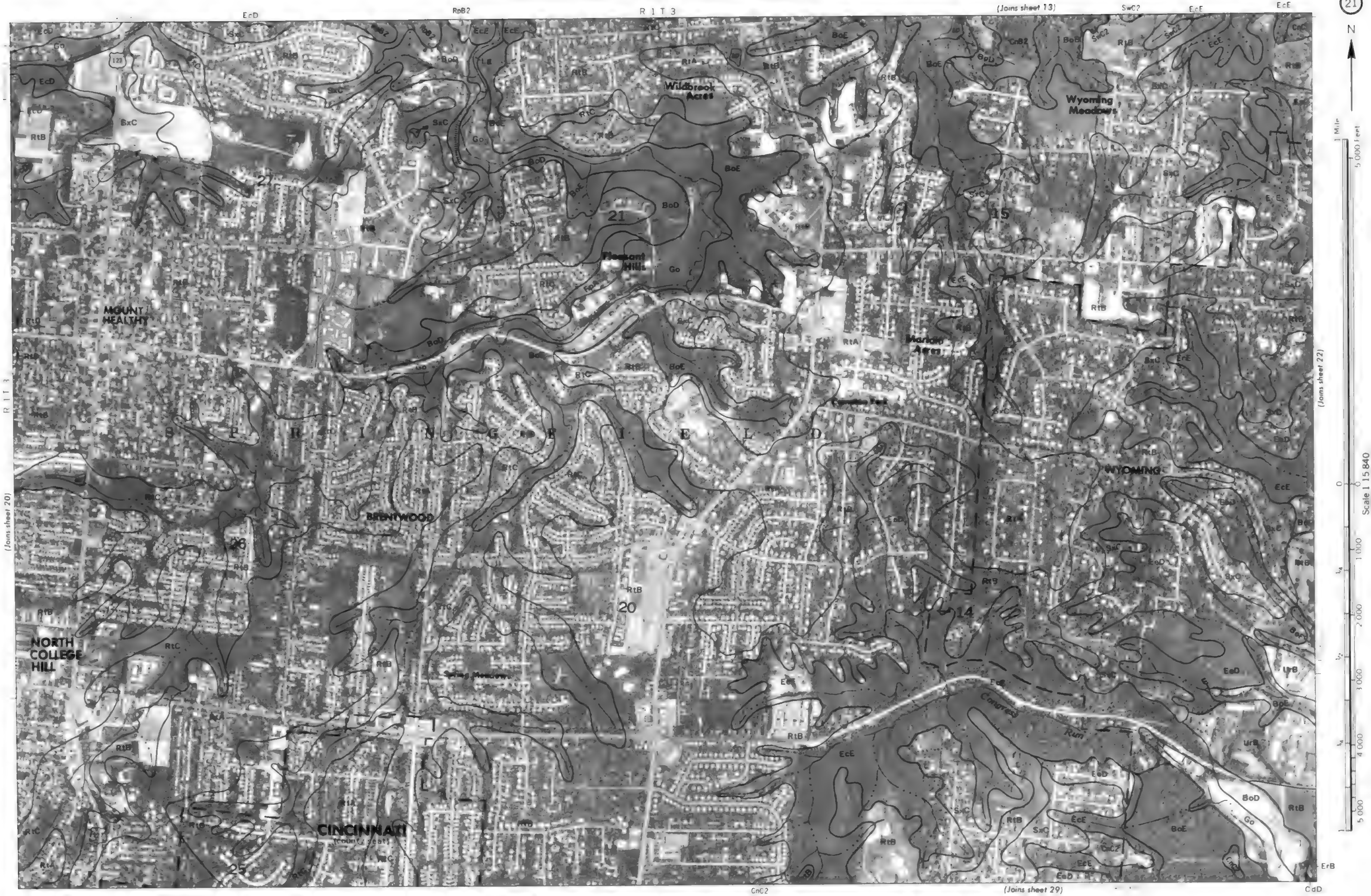

16
N
(Joins sheet 8)
R. 2 T. 3 | R. 2 T. 4
(Joins sheet 15)
(Joins sheet 24)
(Joins sheet 42)
Scale 1:15 840
1 Mile
5 000 Feet
LOVELAND
INDIAN HILL
Sixteen Mile Stand
Jones Farm
Twightwee
North Branch
Branch
Creek
North Branch Sycamore Creek
Polk Run
S Y M M E S
LITTLE MIAMI RIVER
CLERMONT COUNTY
water
36
30
24
35
29
23
5
6
RpA
RpB2
RpC2
BoE
BoD
BoF
AvA
RtB
RtC
RtA
PfE
PfD
Gn
CnC2
CnB2
EcE
EcD
FoA
Po
UmB
Ux
St


R 1 E
(Joins sheet 9)
N
HARRISON
WHITEWATER
WHITEWATER RIVER
MIAMI WHITEWATER FOREST
DEARBORN COUNTY INDIANA
T 2 N
T 1 N
Whitewater River
Dry Fork
(Joins sheet 18)
(Joins sheet 25)
28
29
30
31
32
33
4
5
6
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000

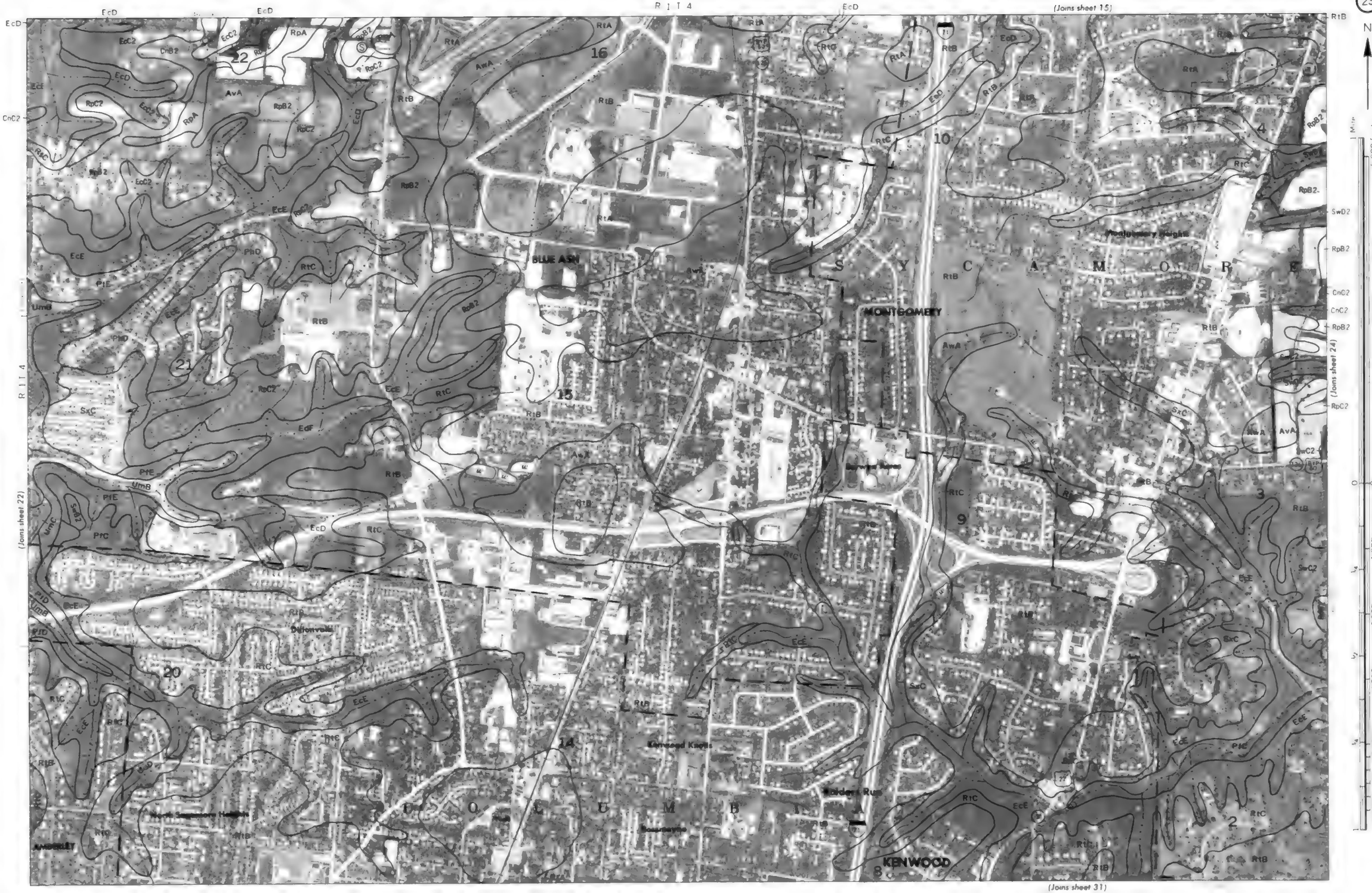

18
N
(Joins sheet 10)
(Joins sheet 17)
(Joins sheet 19)
(Joins sheet 26)
R. 1 E.
MIAMI WHITEWATER FOREST
WHITEWATER
GREAT
MIAMI
Miamitown
Miami Station
Scale 1:15 840
1 Mile
5 000 Feet
R 2 T 1 | R 1 T 1
27
26
25
8
30
31
34
35
36
2
1
7
6
3


(Joins sheet 11)
(Joins sheet 20)
(Joins sheet 18)
(Joins sheet 27)
R 1 T 1 | R 1 T 2
C O L E R A I N
M I A M I
G R E E N
Miami Station
Taylor Creek
Taylors Creek
Blue Rock Creek
N
1 Mile
5 000 Feet
Scale 1:15 840


N
(Joins sheet 12)
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 28)
R 1 T 2
R 1 T 3
1 Mile
5 000 Feet
Scale 1:15 840
COLERAIN HEIGHTS
Wardwood Acres
Galaxy Acres
Crestwood Acres
Barnesburg
SKYLINE ACRES
C O L E R A I N
Autumn Acres
White Oak Meadows
GROESBECK
White Oak
NORTH COLLEGE HILL
RtB
RtC
EcD
EcE
CnC2
ArB2
ArC2
AsB
AsC
AvA
BoD
RpB2
Gn
SxC


21
N
R 1 T 3
(Joins sheet 13)
(Joins sheet 22)
(Joins sheet 29)
(Joins sheet 20)
Wildbrook Acres
Wyoming Meadows
MOUNT HEALTHY
Pleasant Hills
S P R I N G F I E L D
BRENTWOOD
WYOMING
NORTH COLLEGE HILL
CINCINNATI
(county seat)
Congress Run
27
21
15
26
20
14
25
1 Mile
5 000 Feet
Scale 1:15 840


(Joins sheet 14)
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 30)
R 1 T 3 | R 1 T 4
SPRINGFIELD
LINCOLN HEIGHTS
WYOMING
LOCKLAND
READING
Sycamore
Arlington Heights
AMBERLEY
CINCINNATI
N
Scale 1:15 840
1 Mile
5 000 Feet
9
8
3
2
33
32
27
26
EcE
BoE
EcD
SxC
RtB
ErA
Uo
Ux
Um
Pn
RxB
PtE
EcC2
CnC2
EeD
Go
CdD
Gn
RtC
BoD
PtD
UmB
UmD
CeE

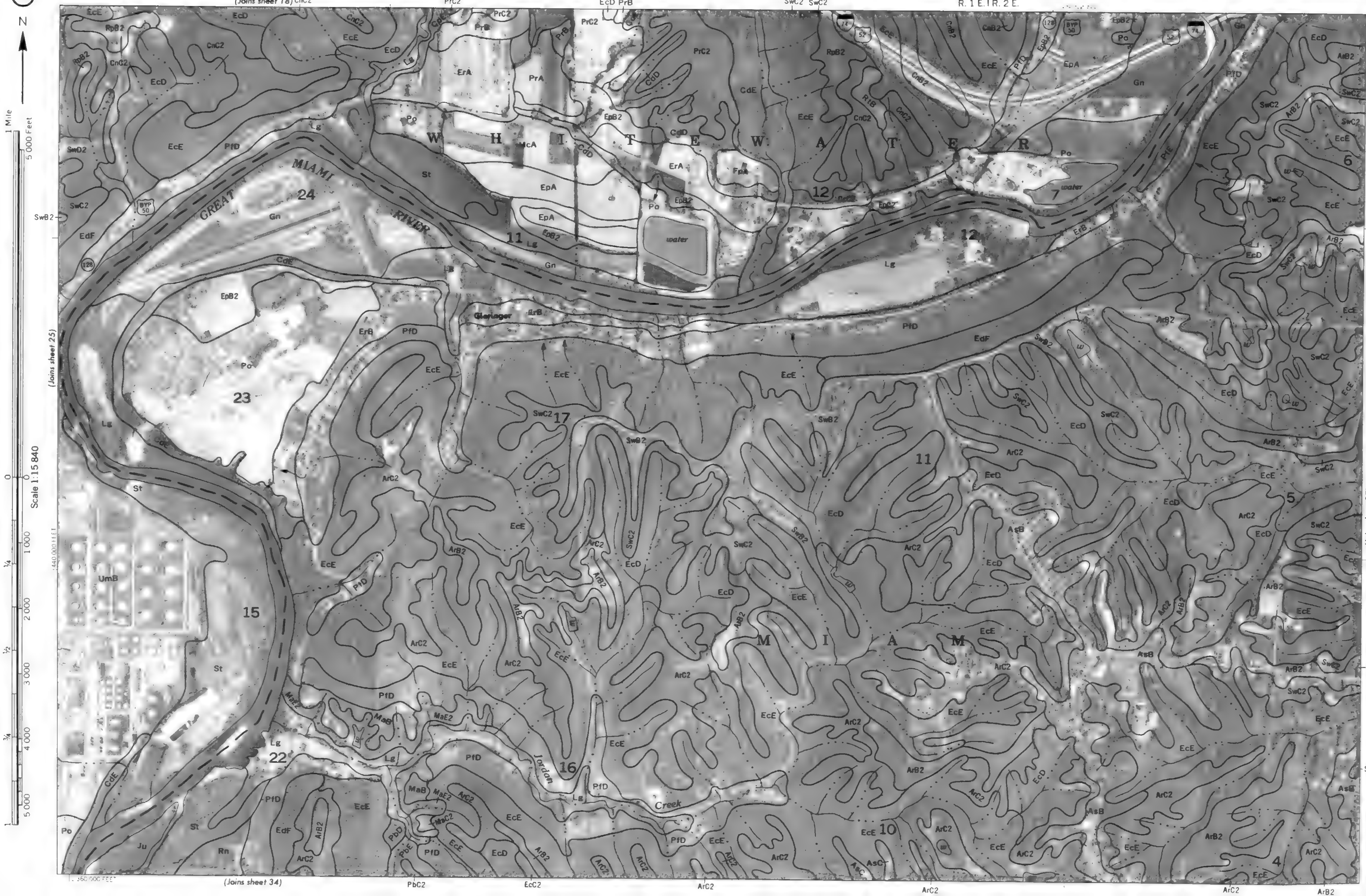

23
N
R 1 E 4
(Joins sheet 15)
(Joins sheet 22)
(Joins sheet 24)
(Joins sheet 31)
BLUE ASH
MONTGOMERY
Montgomery Heights
S Y C A M O R E
C O L U M B I A
Dillonvale
Kenwood Knolls
KENWOOD
AMBERLEY
North Sycamore Heights
Rossmoyne
Bethany Road
Kenwood Road
Sycamore Road
Plainfield Road
Raiders Run
Scale 1:15 840
1 Mile
5000 Feet
16
15
14
22
21
20
10
9
8
4
3
2
EcD
EcE
EcF
EcC2
CnC2
CnB2
RpA
RpB2
RpC2
RtA
RtB
RtC
AvA
AwA
PtD
PtE
PtC
SxC
SwC2
SwD2
UmB
UmC
EcD
RtB
RtC
SxC
RpC2
RpB2
SwD2
CnC2
RpB2

N

Scale 1:15 840

25

HAMILTON COUNTY, OHIO NO. 25
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.


N
(Joins sheet 18)
(Joins sheet 25)
(Joins sheet 27)
(Joins sheet 34)
R. 1 E. | R. 2 E.
WHITEWATER
GREAT MIAMI RIVER
MIAMI
Glenlenger
Jordan Creek
water
Scale 1:15 840
1 Mile
5 000 Feet
R. 2 | 1


(Joins sheet 19)
(Joins sheet 26)
(Joins sheet 28)
(Joins sheet 35)
N
1 Mile
5 000 Feet
Scale 1:15 840
R 2 T 1
R 2 T 2
COLERAIN
GREEN
MIAMI
Taylors Creek
Taylor Creek
Briarly Creek
74
52
36
30
24
18
6
5
35
29
23
17
34
28
EcE
EcD
EdF
ArB2
AsB
SwC2
SwD2
SxC
PfD
MaB2
MaC2
MaD2
Gn
Lg
ArC2


(Joins sheet 20)
(Joins sheet 27)
(Joins sheet 29)
(Joins sheet 36)
N
Scale 1:15 840
1 Mile
5 000 Feet
COLERAIN
GREEN
CINCINNATI
(county seat)
Monfort Heights
Briarly Creek
Frontier Park
Golfway Acres
R 1 T 2 R 1 T 3
R 2 T 3 R 1 T 3
HAMILTON COUNTY, OHIO NO. 28

29

R 1 T 3

(Joins sheet 21)

R 2 T 3 | R 1 T 3

HAMILTON COUNTY, OHIO NO. 29

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(Joins sheet 28)

(Joins sheet 30)

N

1 Mile

5 000 Feet

Scale 1:15 840

(Joins sheet 37)


30
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 22)
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 38)
R 1 T 3 R 1 T. 4
R 2 T 4 R 1 T. 4
Sycamore
AMBERLEY
CINCINNATI
(county seat)
NORWOOD
Mill Creek
RtB
RtC
EcD
EcE
SwD2
RpB2
CnC2
RpC2
BoD
PfD
UrB
UmC
Ua
Wa
Gn
PrB
PrC2
ErB
CdB
31
25
36
30
35
29
HAMILTON COUNTY, OHIO NO. 30

HAMILTON COUNTY, OHIO — SHEET NUMBER 31

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

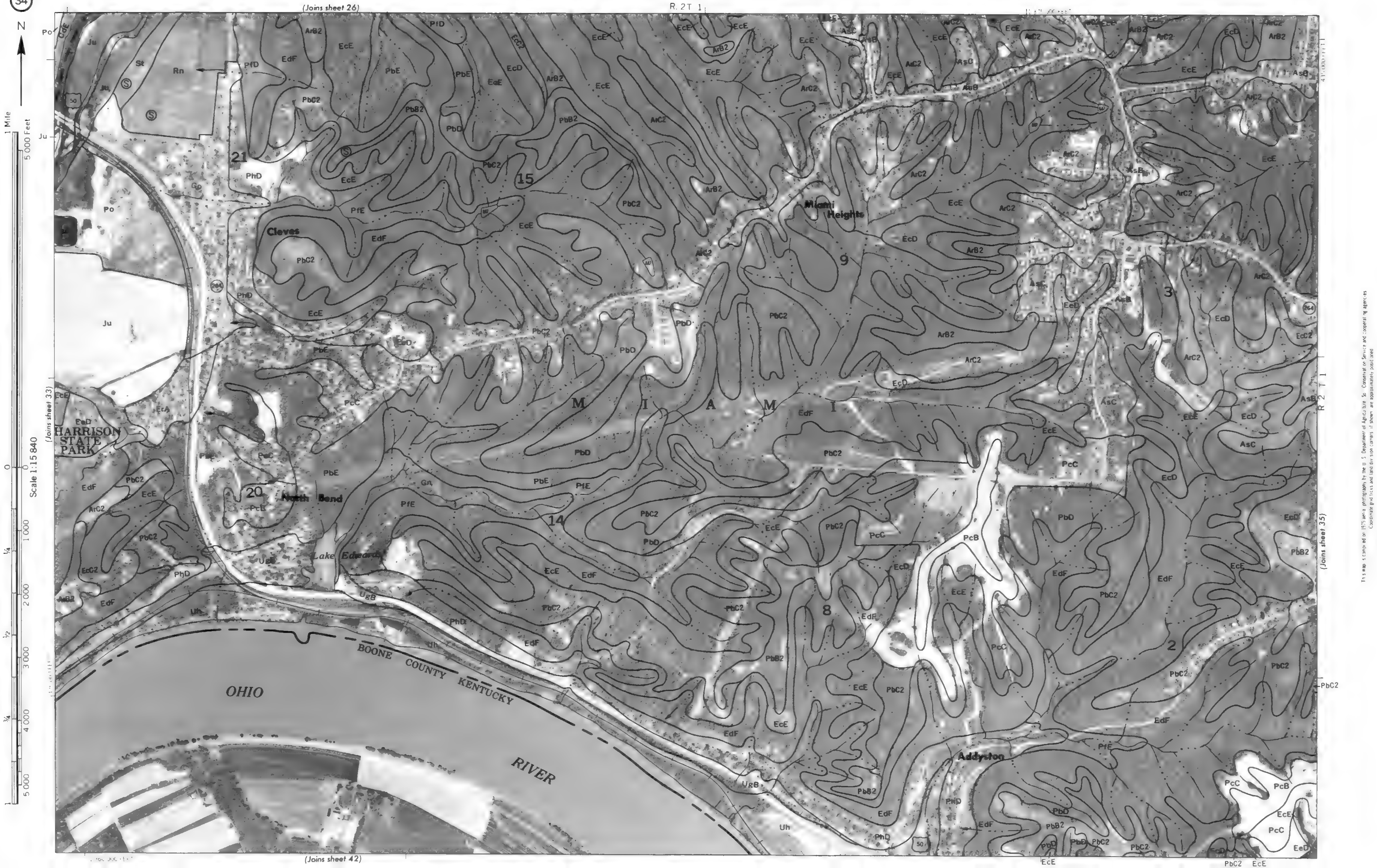
HAMILTON COUNTY, OHIO NO. 31


R 1 T 4
R 1 T 5
(Joins sheet 24)
(Joins sheet 31)
(Joins sheet 40)
(Joins inset, sheet 24)
N
1 Mile
5 000 Feet
Scale 1:15 840
LITTLE MIAMI RIVER
CLERMONT COUNTY
S Y M M E S
C O L U M B I A
Camp Dennison
INDIAN HILL
SwC2
EcE
RpB2
RpA
RtB
RtA
SwD2
BoE
BoD
FoA
FoB2
Gn
Po
CdD
McB
32
26
20
14
31
25
19
13
36
30
24

(33)

HAMILTON COUNTY, OHIO NO. 33

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


34
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 26)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 42)
R. 2 T. 1
Cleves
North Bend
Miami Heights
Addyston
HARRISON STATE PARK
Lake Edwards
M I A M I
OHIO
RIVER
BOONE COUNTY KENTUCKY
HAMILTON COUNTY, OHIO NO. 34

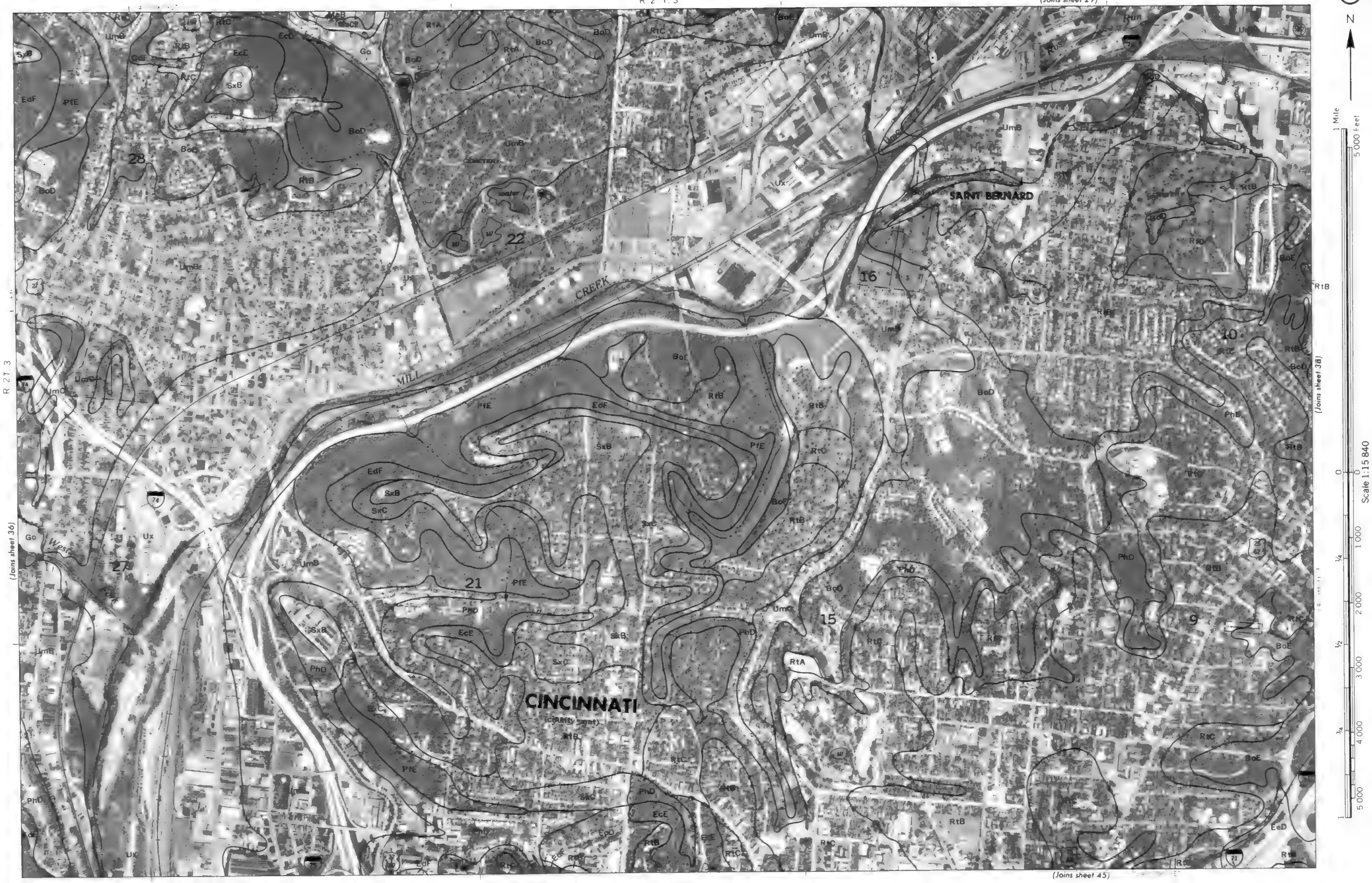
(Joins sheet 27)
(Joins sheet 43)
(Joins sheet 34)
(Joins sheet 36)
CHEVIOT
BRIDGETOWN
CINCINNATI
MACK
GREEN
MIAMI
N
1 Mile
5 000 Feet
Scale 1:15 840


N
1 Mile
5 000 Feet
Scale 1:15 840
R 2 T 2 | R 2 T 3
(Joins sheet 28)
(Joins sheet 35)
(Joins sheet 37)
(Joins sheet 44)
CINCINNATI
(county seat)
CHEVIOT
Mt Airy Center
FOREST
AIRY
MT
West
Fork
(CEMETERY)
EcD
EcE
EdF
EeD
AsB
AsC
ArB2
SwC2
SwB2
SxC
PhD
UmB
UmC
Go

R 2 T. 3

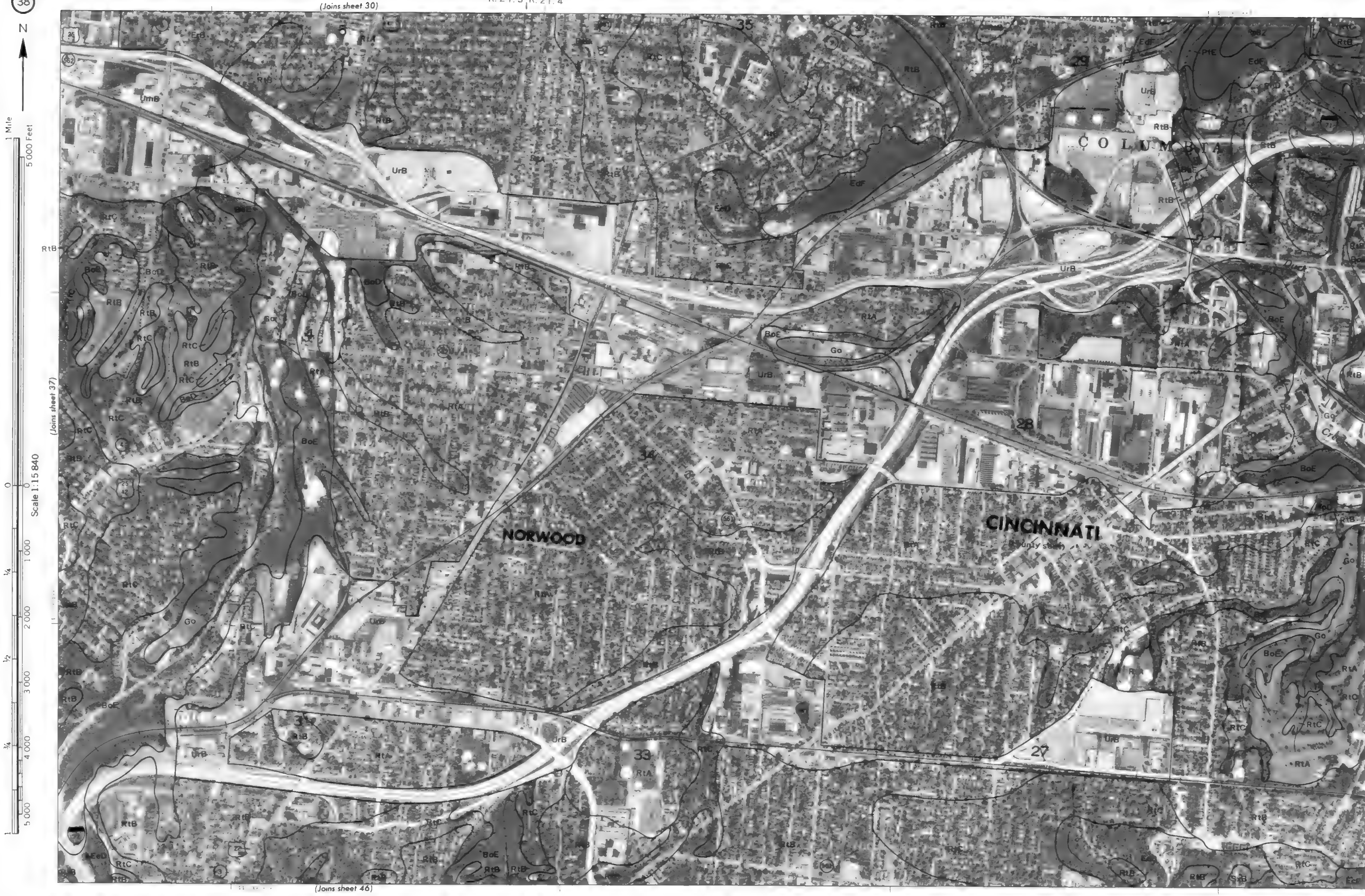
(Joins sheet 29)

(37)



HAMILTON COUNTY, OHIO NO. 37

This map is compiled on 19[illegible] aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


38
N
(Joins sheet 30)
R. 2 T. 3
R. 2 T. 4
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 46)
1 Mile
5 000 Feet
Scale 1:15 840
NORWOOD
CINCINNATI
C O L U M B I A
UrB
RtB
RtC
RtA
BoE
BoD
EdF
EdD
Go
PtE
35
34
33
29
28
27
31
HAMILTON COUNTY, OHIO NO. 38


39
(Joins sheet 31)
R 2 T 4
N
Kenwood Hills
Al Bar Meadows
CINCINNATI
(county seat)
INDIAN HILL
C O L U M B I A
FAIRFAX
MARIEMONT
Plainville
ANDERSON
(Joins sheet 38)
(Joins sheet 40)
(Joins sheet 47)
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000

40

(Joins sheet 32)

(Joins sheet 39)

Scale 1:15 840

1 Mile

5 000 Feet

(Joins sheet 48)

HAMILTON COUNTY, OHIO NO. 40

HAMILTON COUNTY, OHIO NO. 41

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

Scale 1:15 840

HAMILTON COUNTY, OHIO NO. 42

HAMILTON COUNTY, OHIO NO. 43

This map is compiled on 1974 aerial photographs by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HAMILTON COUNTY, OHIO — SHEET NUMBER 44

R 2 T 2 | R 2 T 3

(Joins sheet 36)

N

1 Mile

5 000 Feet

0

1 000

2 000

3 000

4 000

5 000

Scale 1:15 840

(Joins sheet 43)

R. 1 T. 4 | R. 2 T. 3

(Joins sheet 45)

(Joins sheet 50)

HAMILTON COUNTY, OHIO NO. 44

R. 2 T. 3

(Joins sheet 37)

(Joins sheet 46)

(Joins sheet 51)

R. 1 T. 4 R. 2 T. 3 S. (Joins sheet 44)

N

1 Mile

5 000 Feet

Scale 1:15 840

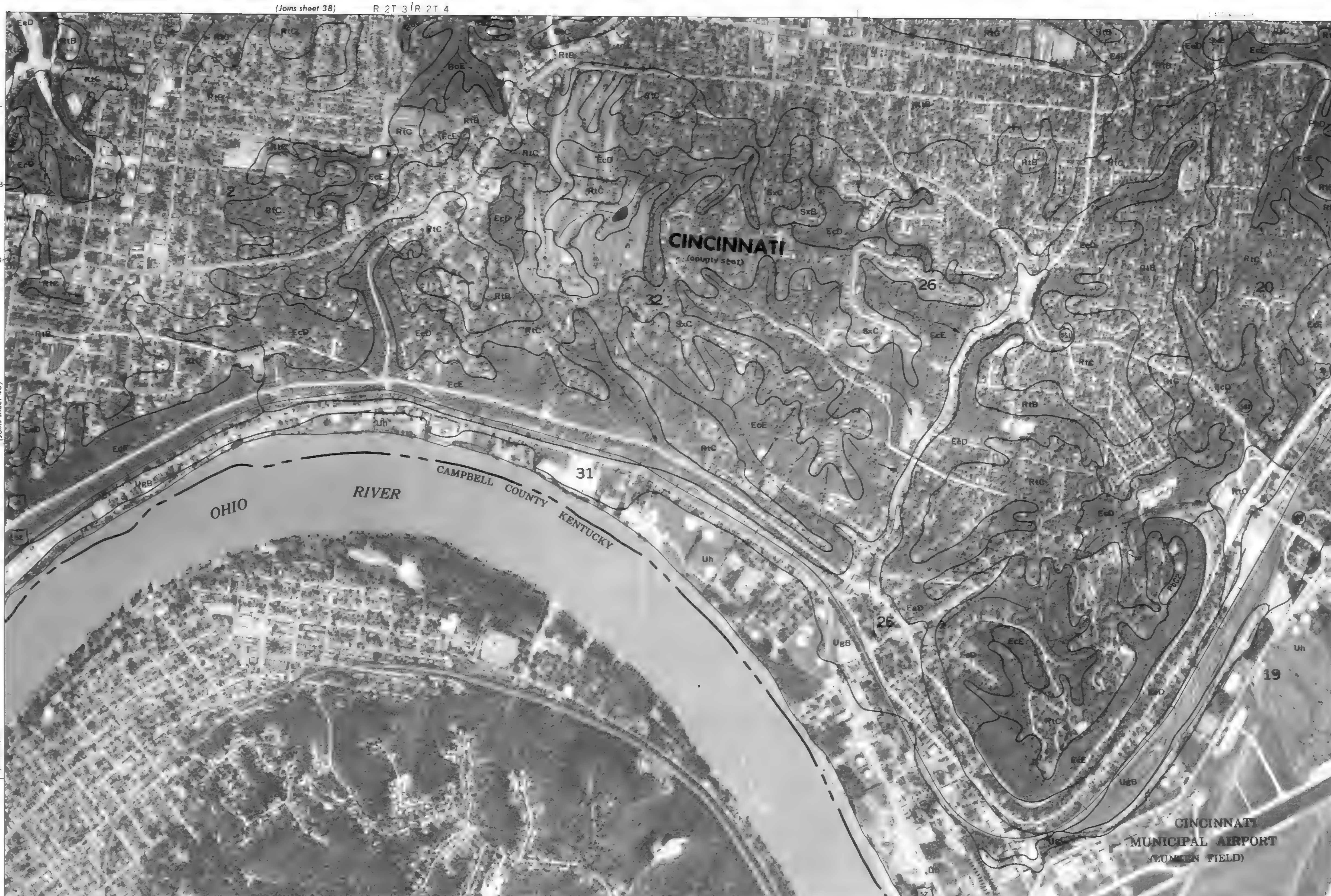
0 1000 2000 3000 4000 5000

0 ¼ ½ ¾

HAMILTON COUNTY, OHIO NO. 45

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(Joins sheet 38) R 2 T 3 | R 2 T 4



(Joins sheet 45)

(Joins sheet 47)

(Joins sheet 52)

R 1 T 5 | R 2 T 4

N

Scale 1:15 840

1 Mile

5 000 Feet

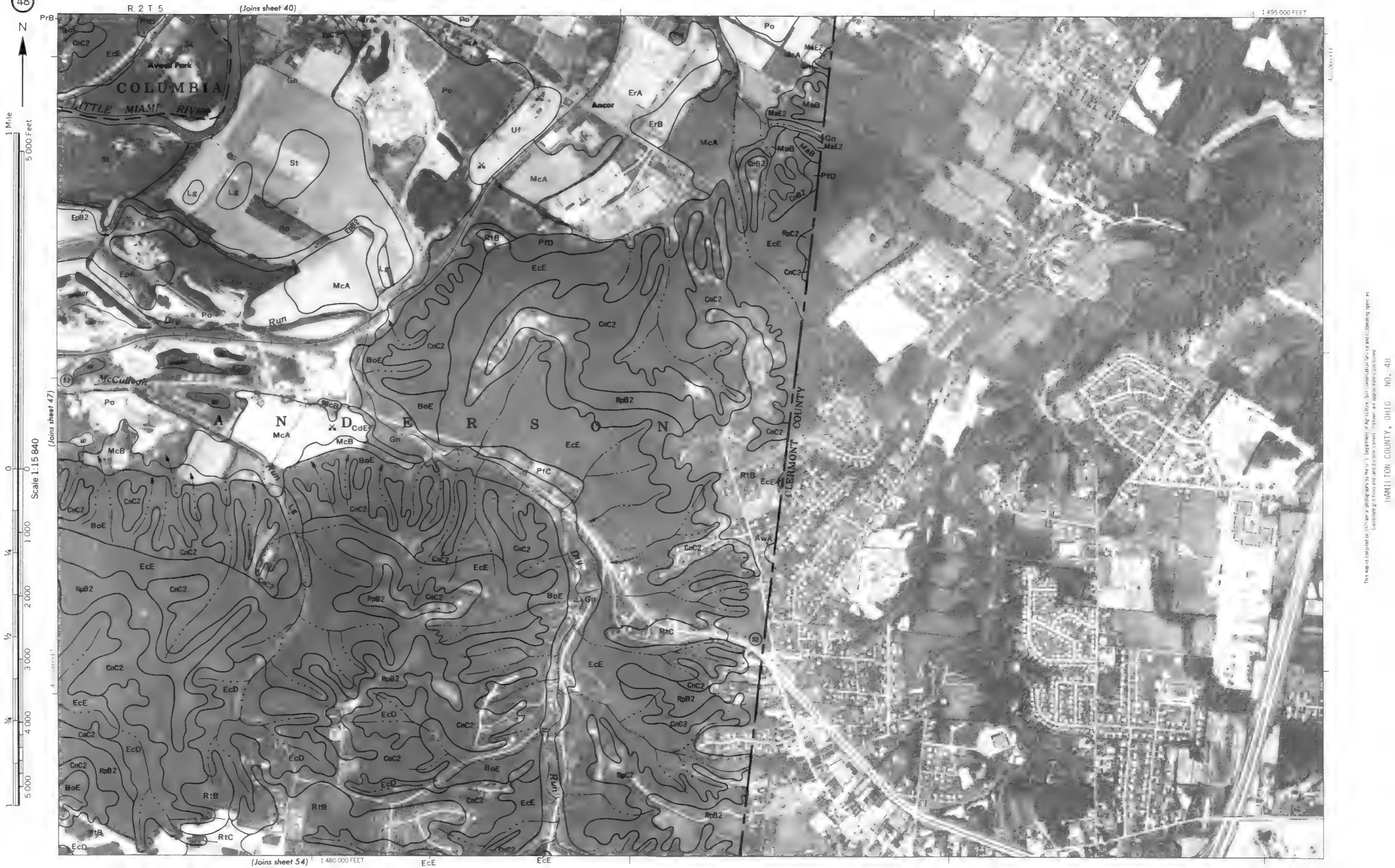
0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

HAMILTON COUNTY, OHIO NO. 46

HAMILTON COUNTY, OHIO NO. 47

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


R. 2 T. 5
(Joins sheet 40)
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 47)
(Joins sheet 54)
1 480 000 FEET
1 495 000 FEET
COLUMBIA
LITTLE MIAMI RIVER
Ancor
McCullough
Run
A N D E R S O N
CLERMONT COUNTY
32
HAMILTON COUNTY, OHIO NO. 48
Po
St
Lg
McA
McB
ErA
ErB
Uf
MaB
MaE2
Gn
CnB2
CnC2
PfD
PfC
RtB
RtC
EcE
EcD
BoE
RpB2
RpC2
EpB2
AwA
CdE

HAMILTON COUNTY, OHIO NO. 49

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HAMILTON COUNTY, OHIO — SHEET NUMBER 50

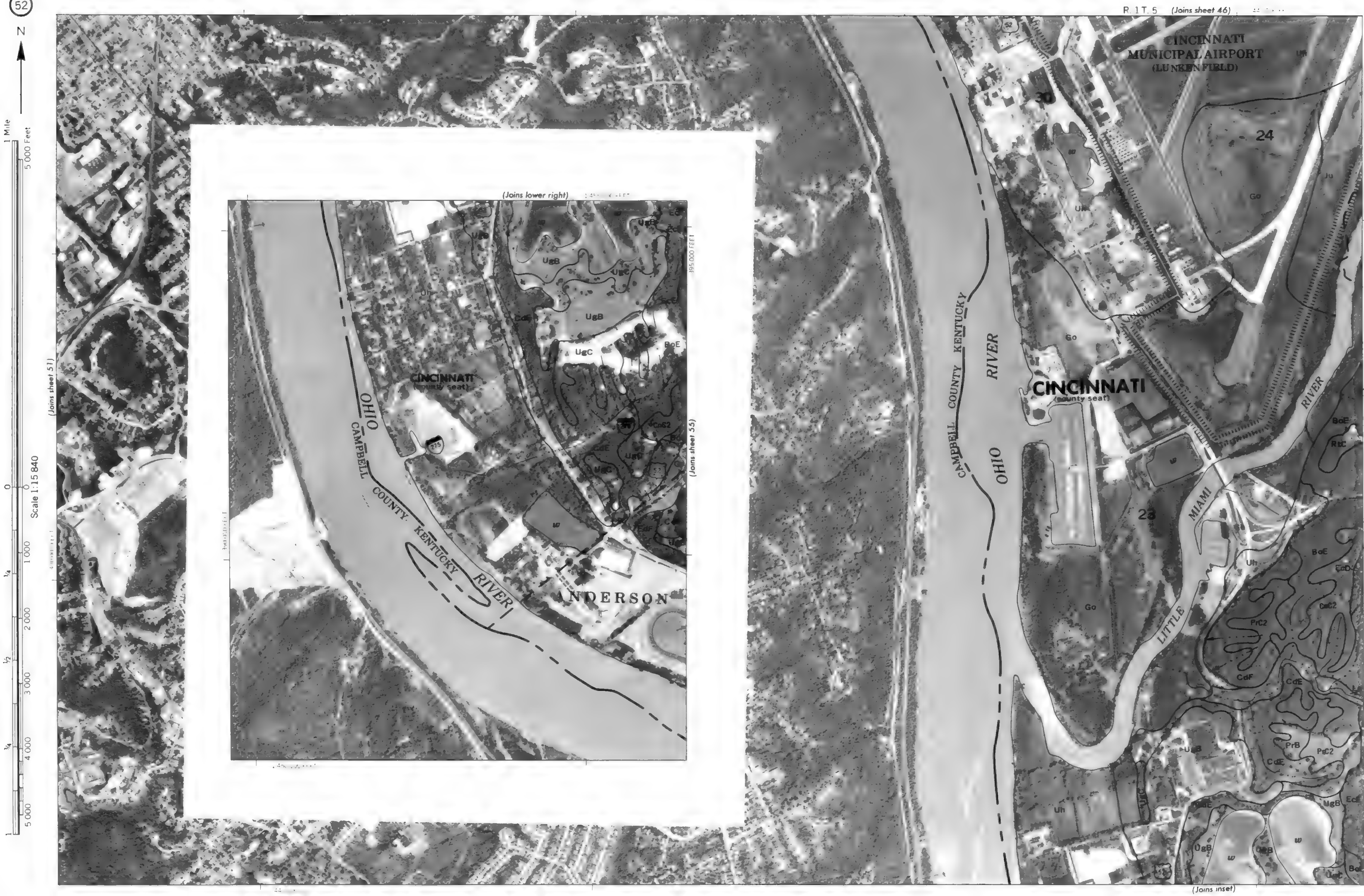
R. 1 T. 3 | R. 1 T. 4

Scale 1:15 840

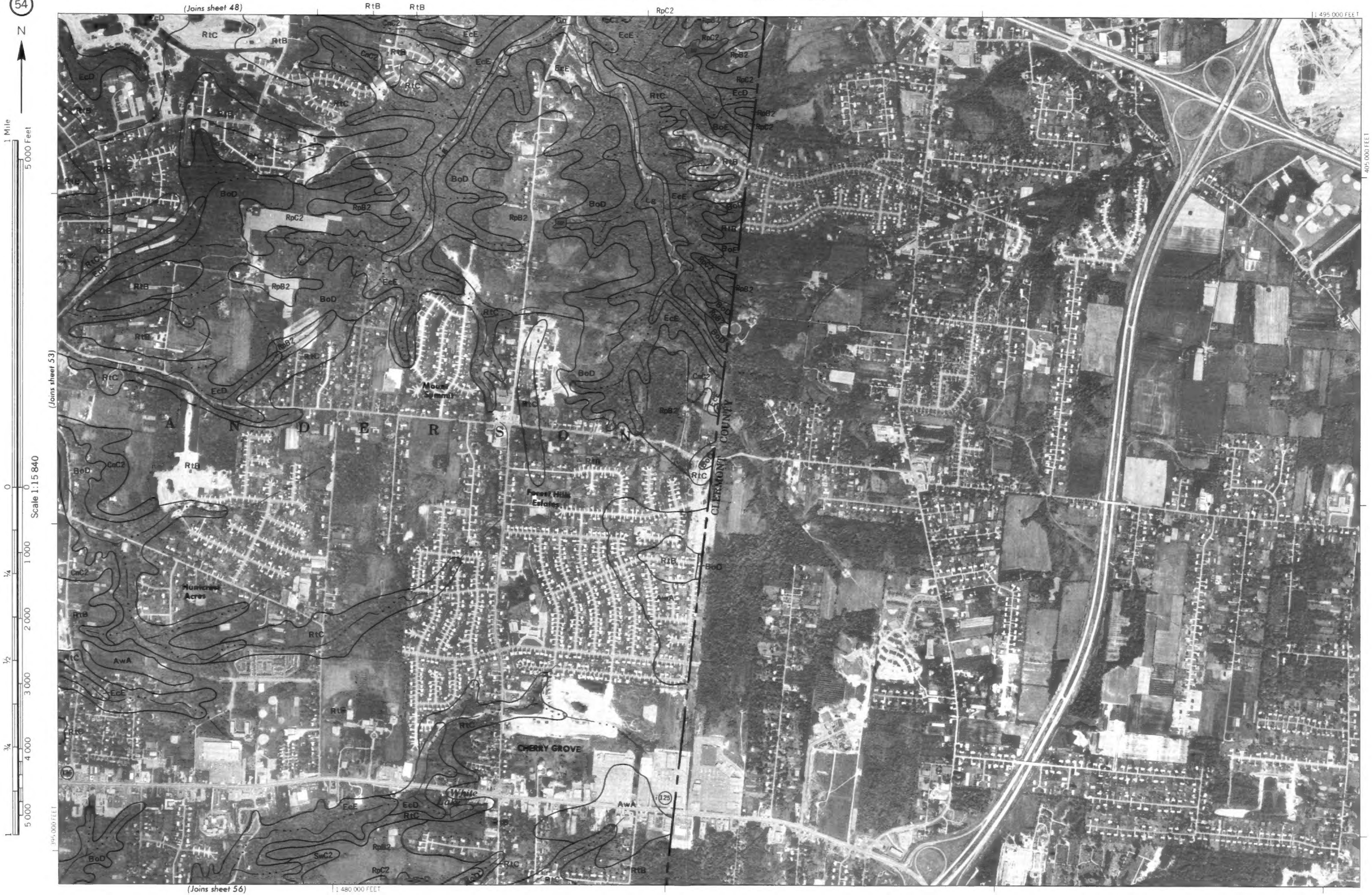
1 Mile

5 000 Feet

HAMILTON COUNTY, OHIO NO. 51


52
N
1 Mile
5 000 Feet
Scale 1:15 840
R. 1 T. 5
(Joins sheet 46)
(Joins sheet 51)
(Joins sheet 53)
(Joins inset)
(Joins lower right)
(Joins sheet 55)
CINCINNATI
MUNICIPAL AIRPORT
(LUNKEN FIELD)
CINCINNATI
(county seat)
ANDERSON
OHIO
RIVER
CAMPBELL
COUNTY
KENTUCKY
LITTLE
MIAMI
RIVER
30
24
23
Uh
Go
Ju
UgB
UgC
CdF
BoE
CnC2
RtC
EdD
PrC2
PrB
CdE
MgB
EcD
w


53
N
(Joins sheet 47)
(Joins sheet 52)
(Joins sheet 54)
(Joins sheet 55)
R. 1 T. 5
1 460 000 FEET
1 475 000 FEET
LITTLE MIAMI RIVER
Beechview Estates
CINCINNATI
(county seat)
ANDERSON
Clough
Creek
Sherwood Village
Pebbleton Hills
Fruit Hill
Forestville
Mt. Washington Heights
Salem Heights
Watch Farm Acres
1 Mile
5 000 Feet
Scale 1:15 840

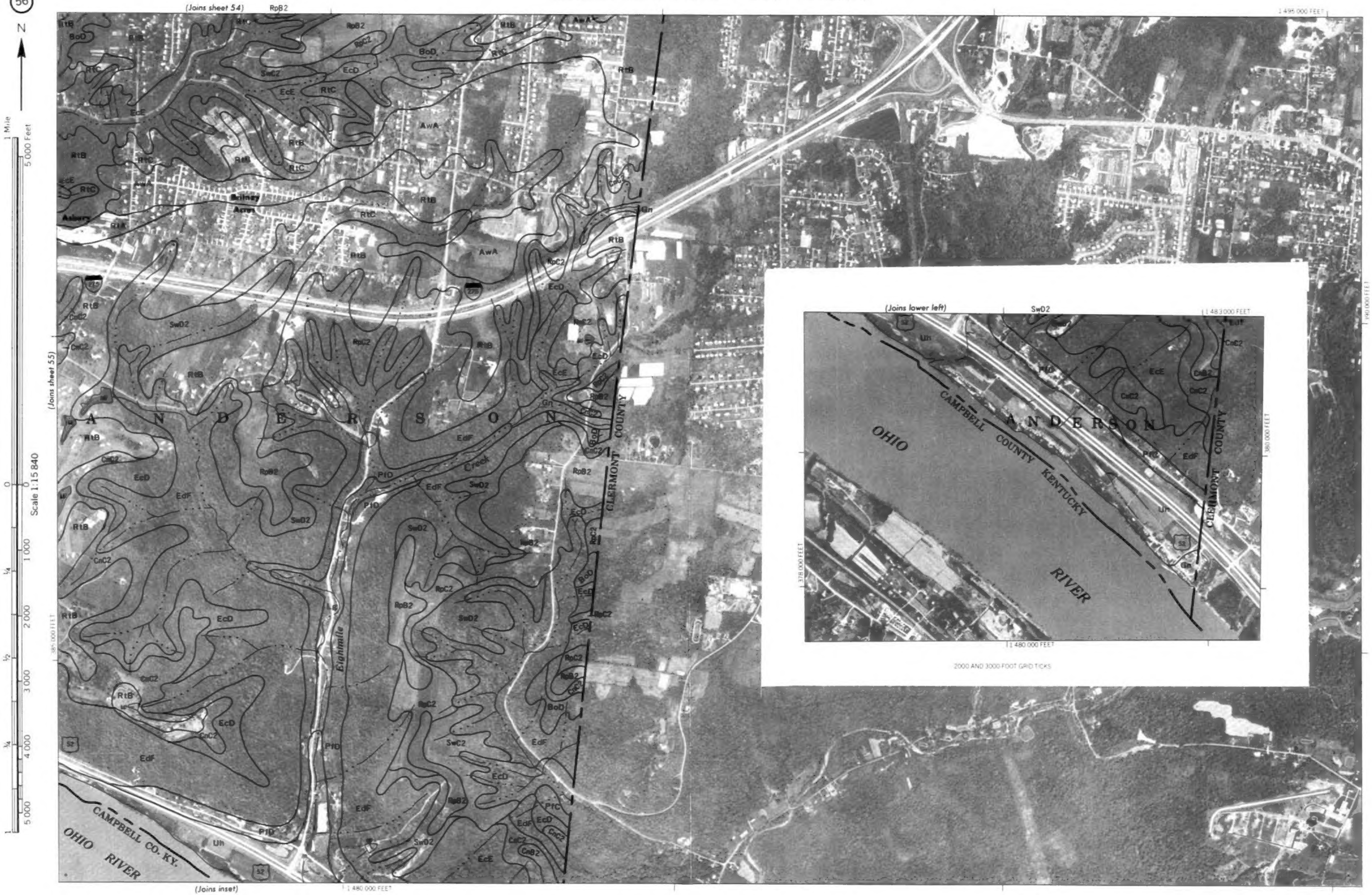


This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HAMILTON COUNTY, OHIO NO. 54

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

HAMILTON COUNTY, OHIO NO. 55



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